COMPSCI 326
Web Programming

React State and Interactivity

Objectives

- Understand React State
- Understand React Interactivity

React Props

React has a one-way data flow beginning from the top-most component and working its way down through each of the sub-components.

The way we communicate data in this tree of components is by passing the data through **props**.

We can then use **props** to populate a UI component with the data it needs to render.

Facebook Comment

```
.
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├── app.js
├── components
│   ├── comment.js
│   ├── commententry.js
│   ├── commentthread.js
│   ├── feed.js
│   ├── feeditem.js
│   ├── statusupdate.js
│   └── statusupdateentry.js
├── database.js
├── server.js
└── util.js
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        <div className="media-left media-top">
          PIC
        </div>
        <div className="media-body">
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            {this.props.postDate}
        </div>
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We pass along data using props.

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<Comment author="Someone Else" postDate="20 hrs">
  hope everything is ok!</Comment>
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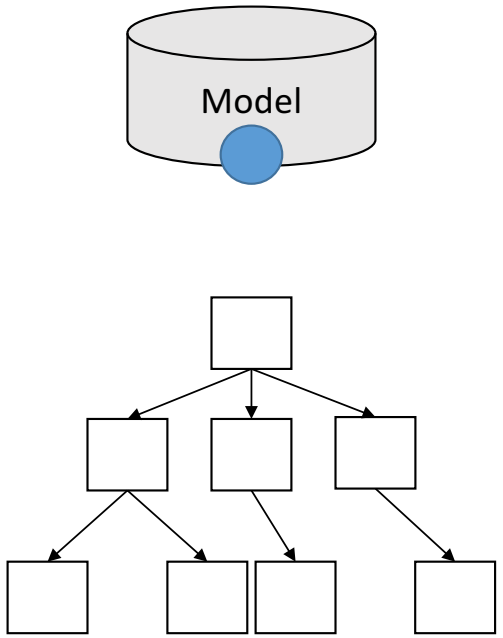
Changing Data

- Data is pushed through the react component tree from the model.



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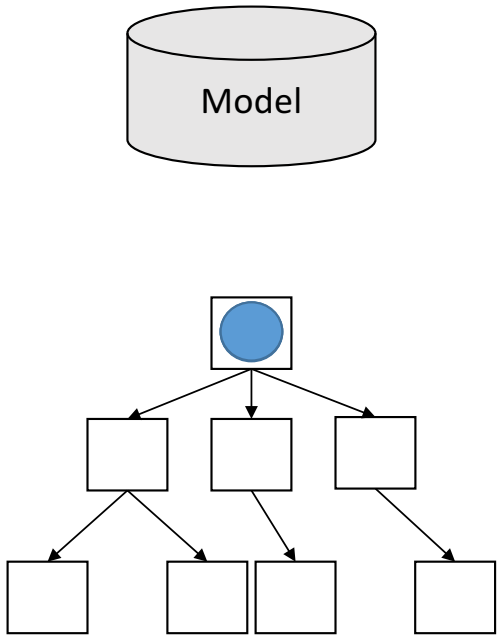

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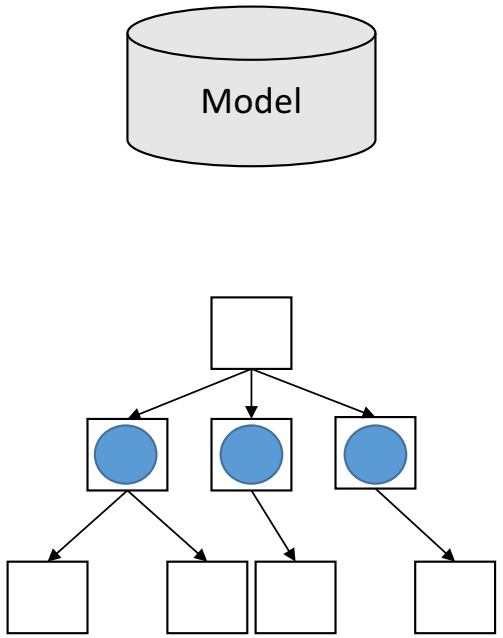

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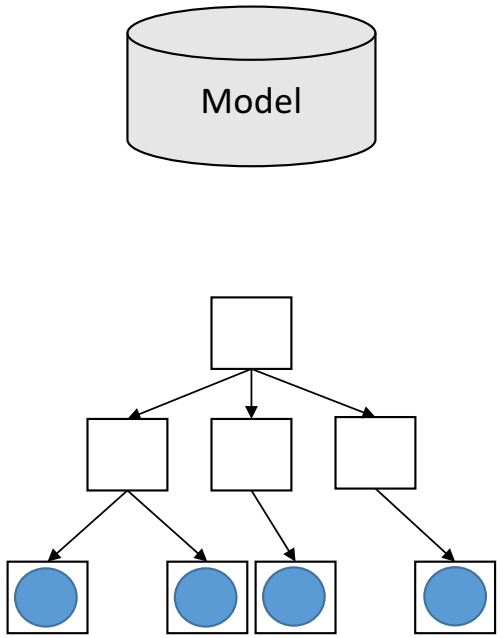

Changing Data

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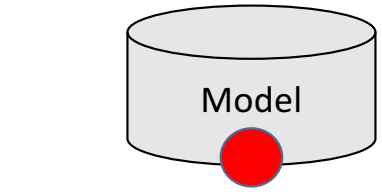
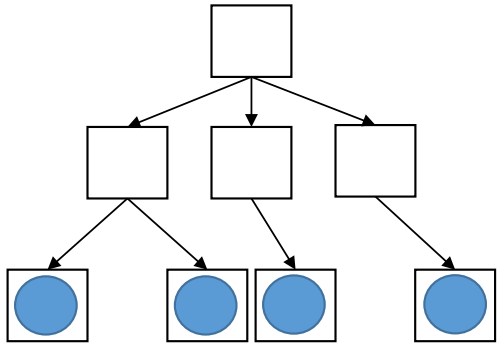
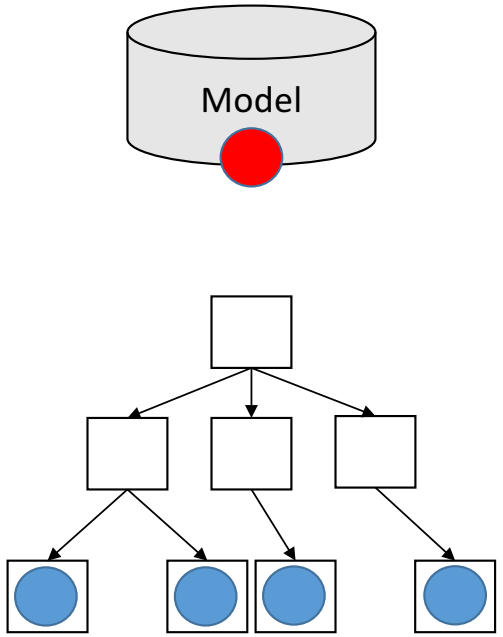




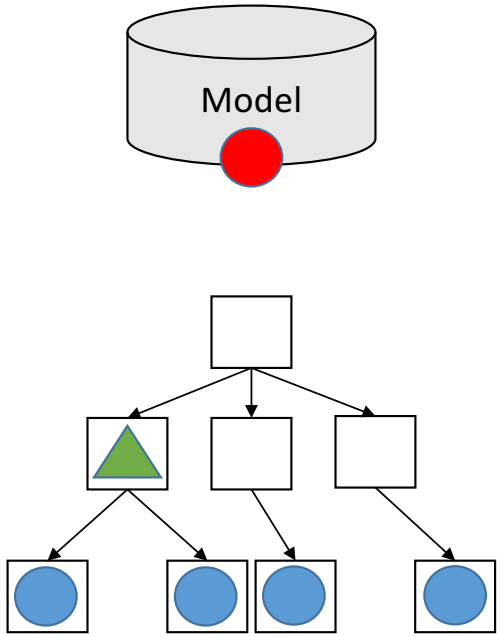
Changing Data

- Data is pushed through the react component tree from the model.
- What if our model changes?
- How do we re-render the React components to reflect those changes?



React State

- In addition to **props**, React components may also maintain **state**.



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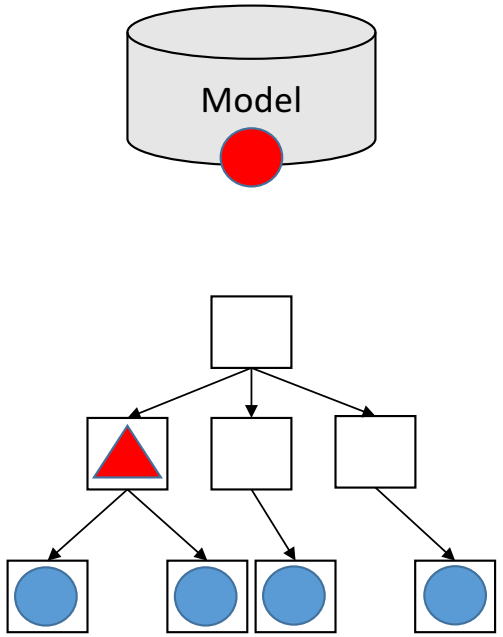

React State

- In addition to **props**, React components may also maintain **state**.
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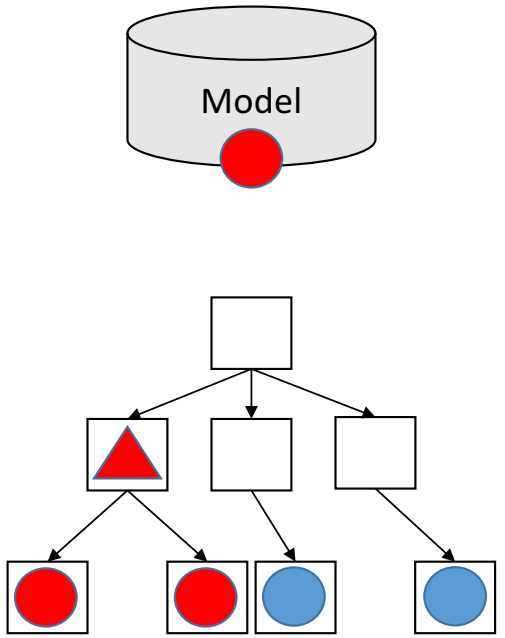
- Which will cause each child component to be re-instantiated with new **prop** values.



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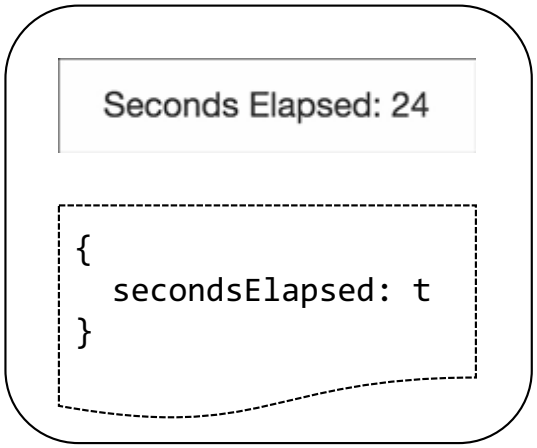


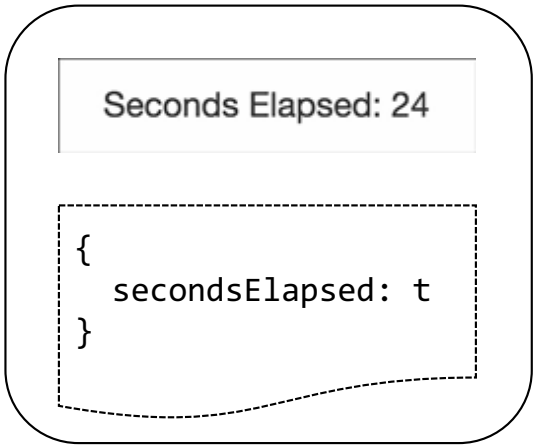
This is a simple Timer application.

After each second the component's view is updated to report the number of elapsed seconds.

The data associated with that view is stored as part of the component's **state**.

The **state** and the view are tied together by firing an event every second that updates the state of the Timer component.

A Timer Application

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  constructor(props) {
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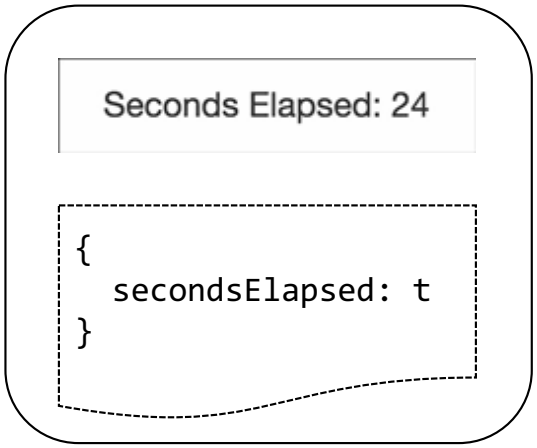


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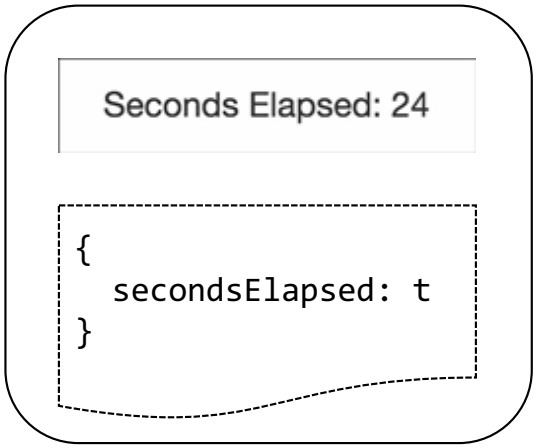


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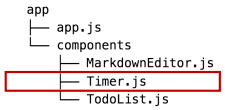
We define a constructor for initializing the props and setting **this.state** – a *special* variable to maintain the state of a component.



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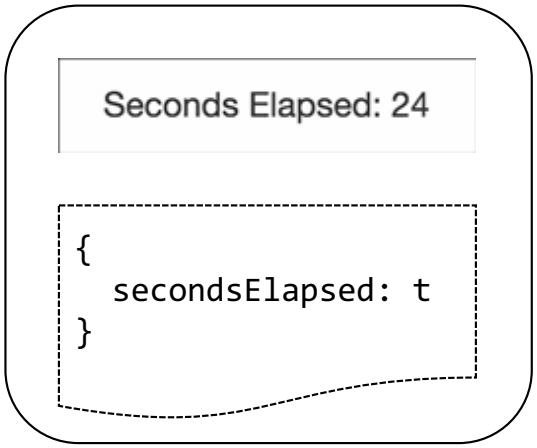


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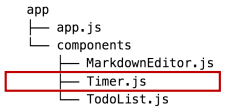
In this case, our component's initial state is an object with a single property **secondsElapsed** with an initial value of 0.



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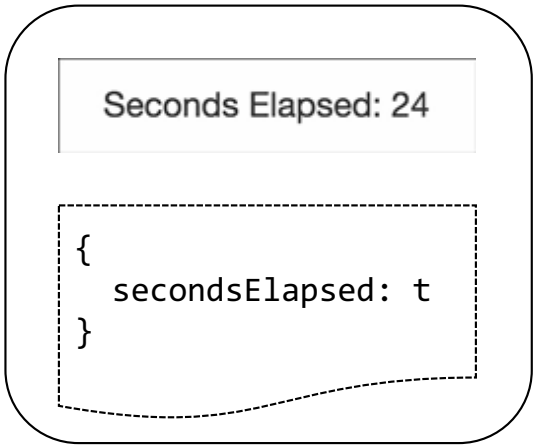


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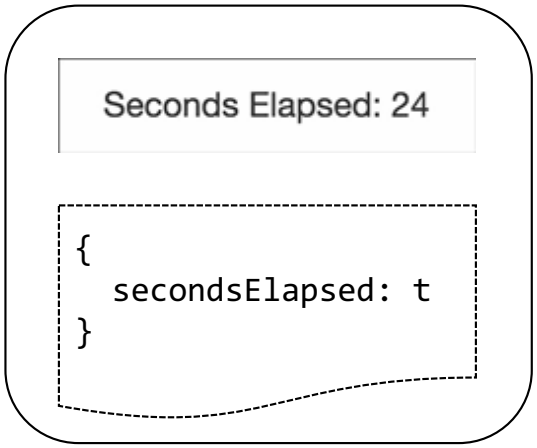


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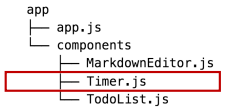

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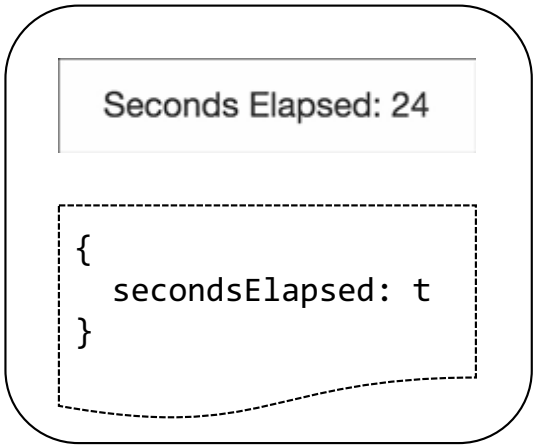


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But, how do we update the state of the component and update the corresponding view?

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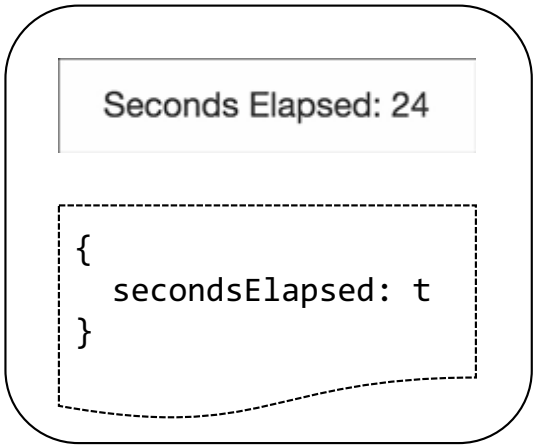


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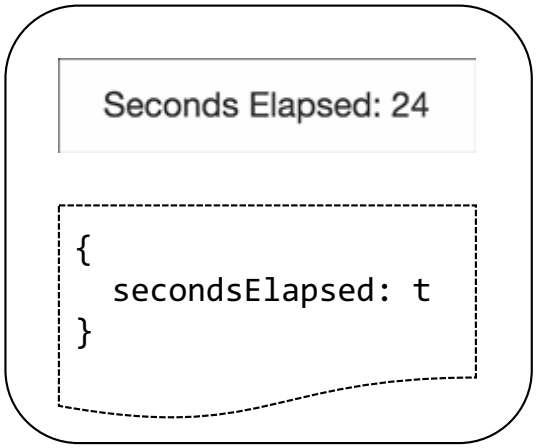


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This function then returns the new state given the old state.

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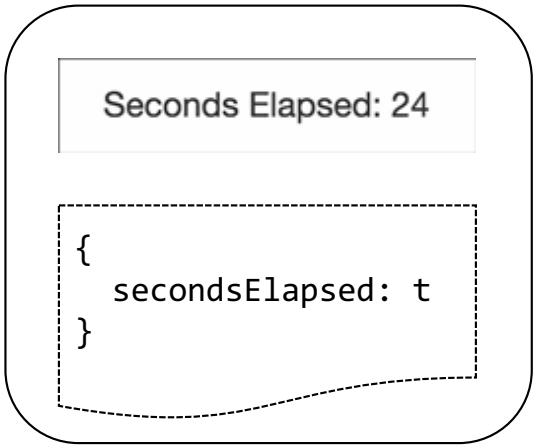

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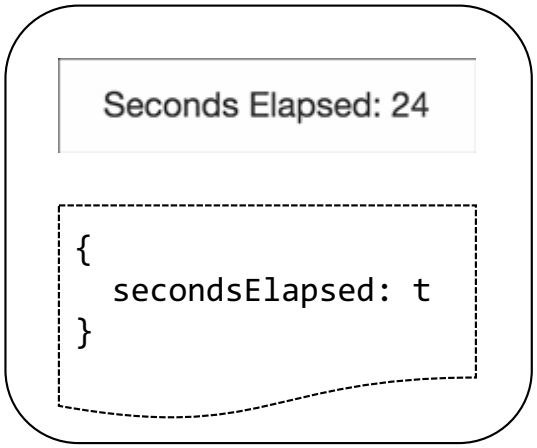

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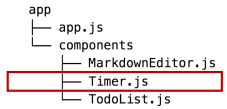
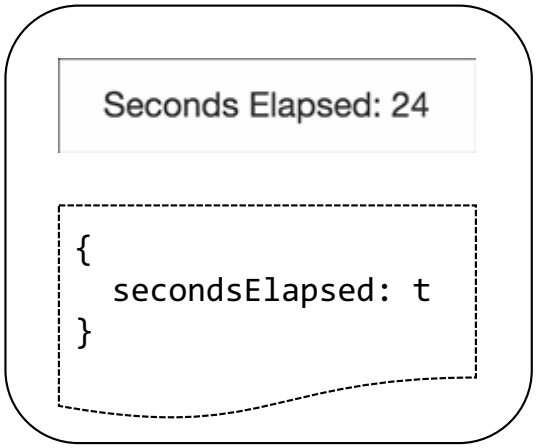
It turns out that when **this.setState** is invoked, React will update the state and *automatically* call the **render** method to re-render the component.



A Timer Application



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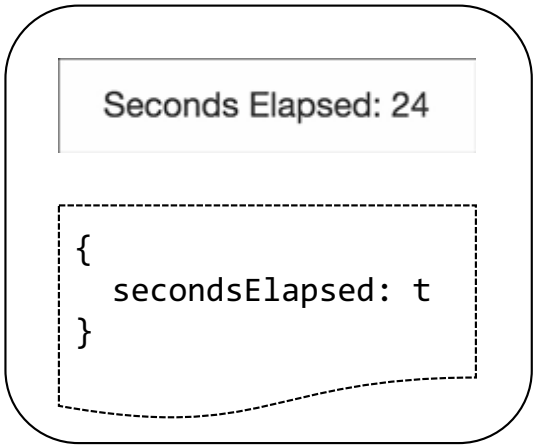

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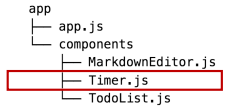
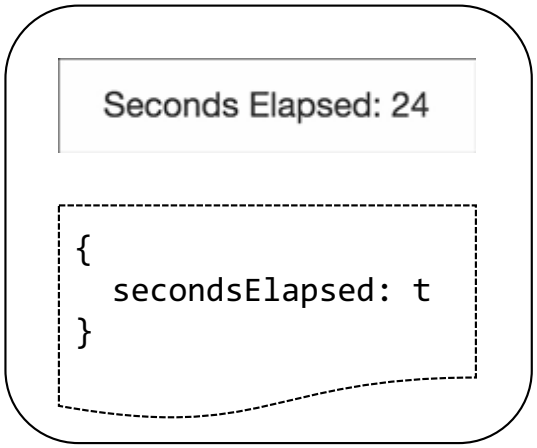


A Timer Application




```
import React from 'react';

export default class Timer extends React.Component {
  constructor(props) {
    super(props);
    this.state = {secondsElapsed: 0};
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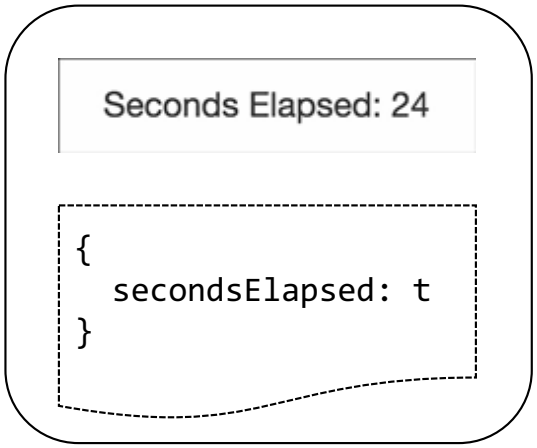
It turns out that there are other *special* functions associated with React components.

componentDidMount is one of these special functions.

A Timer Application

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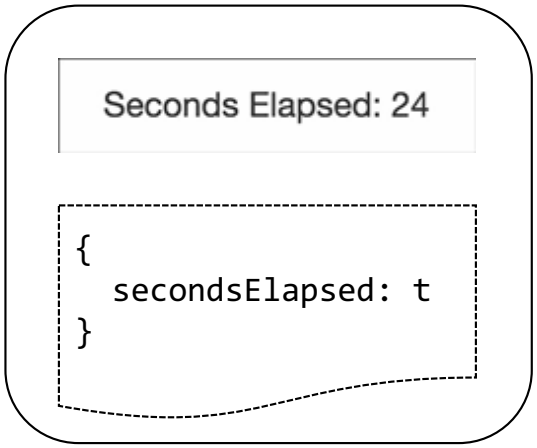
componentDidMount is called automatically by React right after the component is mounted and rendered in the browser.

A Timer Application

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In the Timer component we want to begin the timer right after it has been rendered the first time.

So, we use **setInterval** to call the **tick** method after each second.

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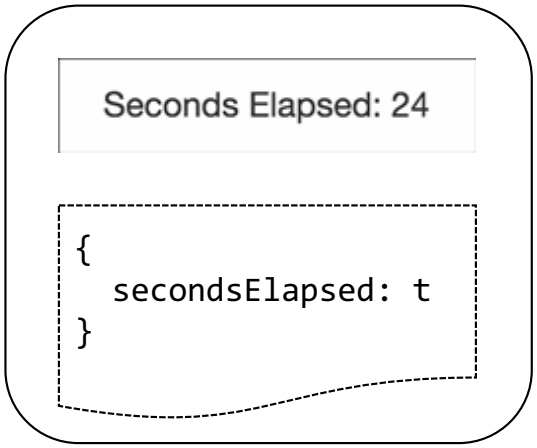


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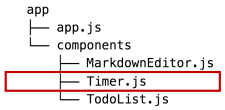
componentDidMount is called automatically by React right after the component is mounted and rendered in the browser.

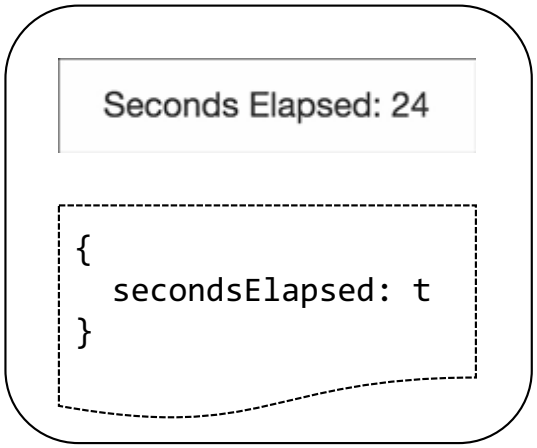
In the Timer component we want to begin the timer right after it has been rendered the first time.

So, we use **setInterval** to call the **tick** method after each second.

The return value of **setInterval** is an object that identifies that particular interval. So…



A Timer Application

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    );
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}
```

… The call to **tick** every second can be removed, or “cleared”.

When do we want this to happen?

In another special React method called **componentWillUnmount**.

Called right after the component is unmounted (removed from the DOM) and “destroyed”.

A ToDo List Application

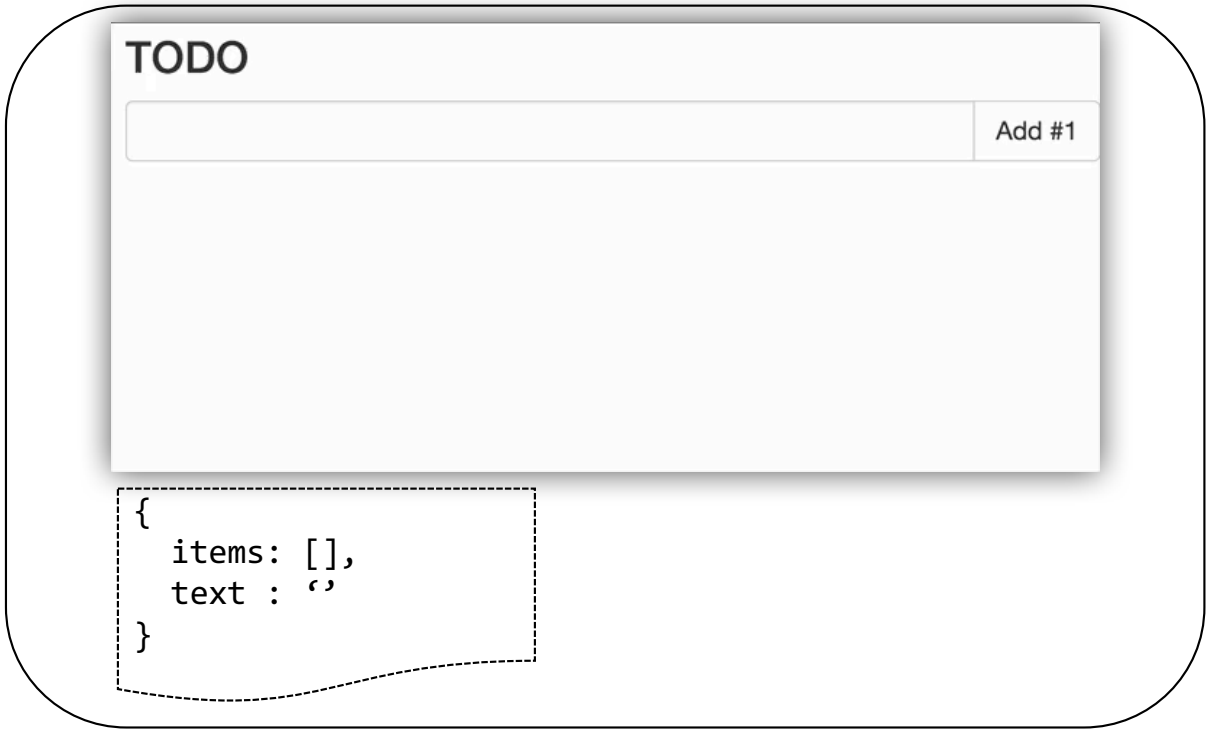
This is a simple ToDo application.

The ToDo application allows the user to type in a task into the ToDo list input text box.

The user can either hit *enter* or press the button “Add #n” to add the task to the list .

What is the **state** of this application?

A ToDo List Application



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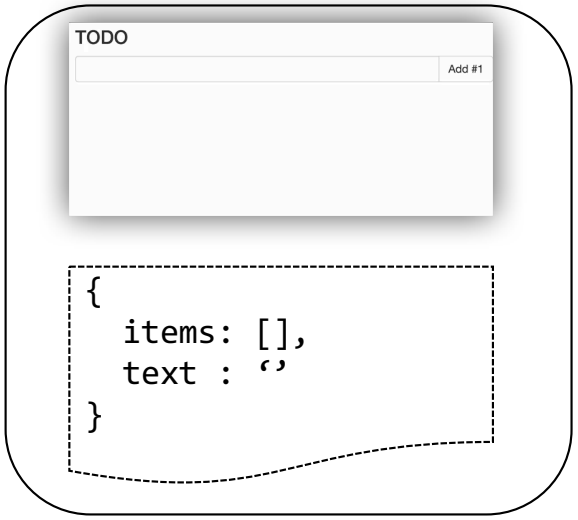


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```

```
import React from 'react';

export default class TodoApp extends React.Component {
  constructor(props) {
    super(props);
    this.state = {items: [], text: ''};
  }

  render() {
    return (
      <div>
        <h3>TODO</h3>
        <TodoList items={this.state.items} />
        <form onSubmit={(e) => this.handleSubmit(e)} className="input-group">
          <input onChange={(e) => this.handleChange(e)}
            className="form-control" value={this.state.text} />
          <span className="input-group-btn">
            <button className="btn btn-default">
              {'Add #' + (this.state.items.length + 1)}
            </button>
          </span>
        </form>
      </div>
    );
  }

  handleChange(e) {
    this.setState({text: e.target.value});
  }

  handleSubmit(e) {
    e.preventDefault();
    var newItem = {
      text: this.state.text,
      id: Date.now()
    };
    this.setState((prevState) => ({
      items: prevState.items.concat(newItem),
      text: ''
    }));
  }
}


class TodoList extends React.Component {
  render() {
    return (
      <ul>
        {this.props.items.map(item => (
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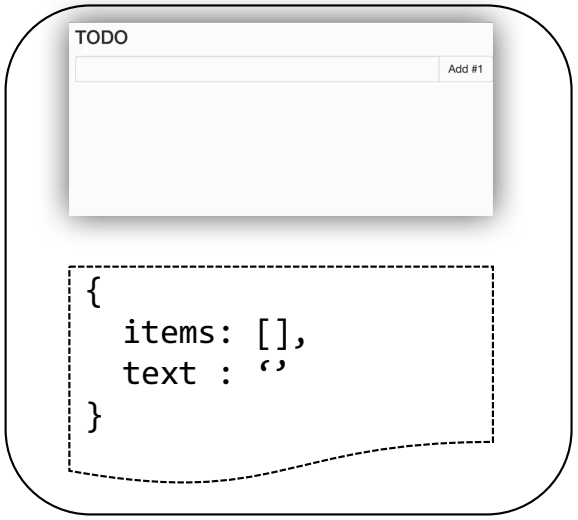


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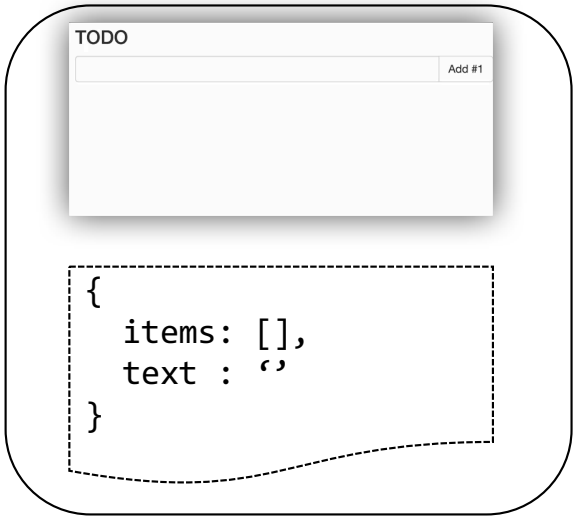


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As usual, we extend **React.Component** to create a new component called **TodoApp**.

We call the super class constructor to initialize the **props** correctly.

```
class TodoList extends React.Component {
  render() {
    return (
      <ul>
        {this.props.items.map(item => (
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        ))}
      </ul>
    );
  }
}
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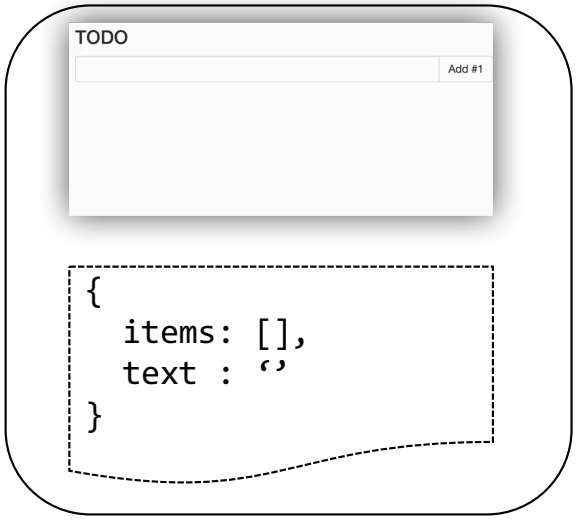


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As usual, we extend **React.Component** to create a new component called **TodoApp**.

We call the super class constructor to initialize the **props** correctly.

We initialize the state of this component with the todo list items and the text contained in the input box.

```
class TodoList extends React.Component {
  render() {
    return (
      <ul>
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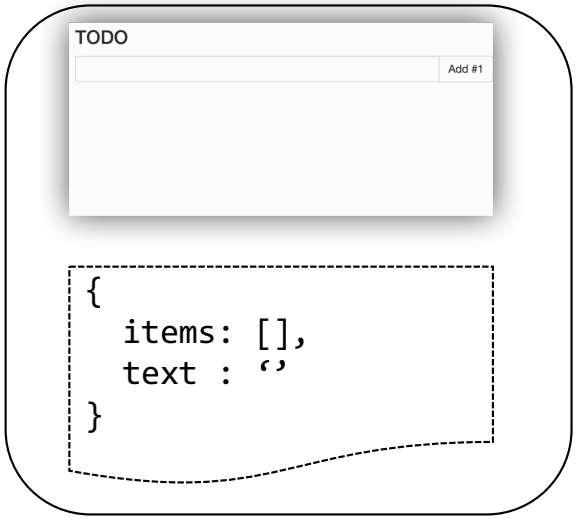


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```

The **render** method consists of three important parts:

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class TodoList extends React.Component {
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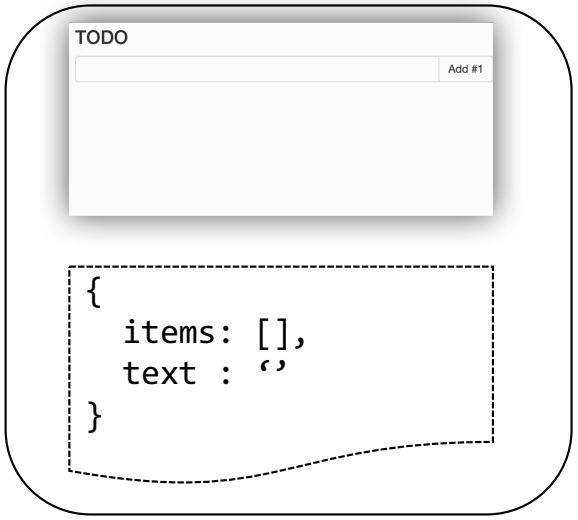


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}
```

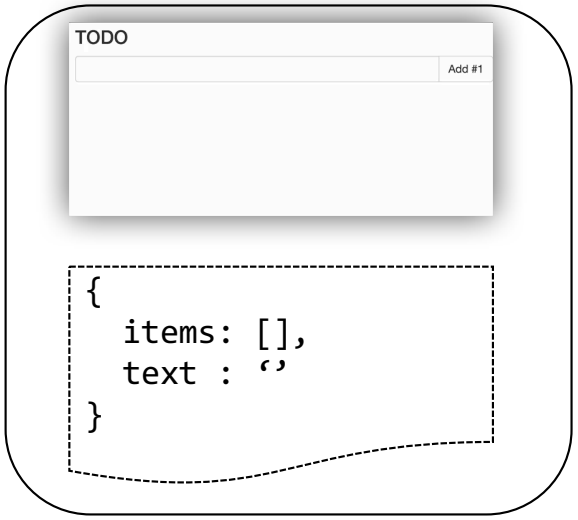
The **render** method consists of two important parts:

- The **TodoList** component
  A separate component for managing and rendering the list of tasks

```
class TodoList extends React.Component {
  render() {
    return (
      <ul>
        {this.props.items.map(item => (
          <li key={item.id}>{item.text}</li>
        ))}
      </ul>
    );
  }
}
```

```
app
├── app.js
└── components
    ├── MarkdownEditor.js
    ├── Timer.js
    └── TodoList.js
```

A ToDo List Application




```
import React from 'react';

export default class TodoApp extends React.Component {
  constructor(props) {
    super(props);
    this.state = {items: [], text: ''};
  }

  render() {
    return (
      <div>
        <h3>TODO</h3>
        <TodoList items={this.state.items} />
        <form onSubmit={(e) => this.handleSubmit(e)} className="input-group">
          <input onChange={(e) => this.handleChange(e)}
            className="form-control" value={this.state.text} />
          <span className="input-group-btn">
            <button className="btn btn-default">
              {'Add #' + (this.state.items.length + 1)}
            </button>
          </span>
        </form>
      </div>
    );
  }

  handleChange(e) {
    this.setState({text: e.target.value});
  }

  handleSubmit(e) {
    e.preventDefault();
    var newItem = {
      text: this.state.text,
      id: Date.now()
    };
    this.setState((prevState) => ({
      items: prevState.items.concat(newItem),
      text: ''
    }));
  }
}
```

The **render** method consists of two important parts:

- The **TodoList** component
  A separate component for managing and rendering the list of tasks
- The form containing the input box the user types the task in to and the button we will use to add a task to the todo list.

```
class TodoList extends React.Component {
  render() {
    return (
      <ul>
        {this.props.items.map(item => (
          <li key={item.id}>{item.text}</li>
        ))}
      </ul>
    );
  }
}
```

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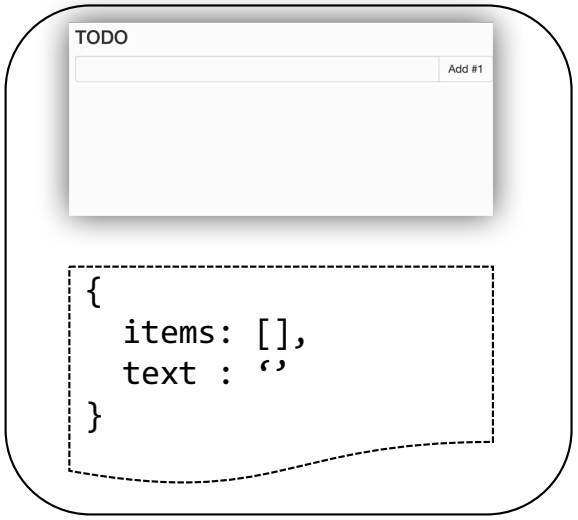


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      items: prevState.items.concat(newItem),
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}
```

React provides support for each of the possible events that might occur on a DOM element as an attribute that can be assigned a function.

```
class TodoList extends React.Component {
  render() {
    return (
      <ul>
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        ))}
      </ul>
    );
  }
}
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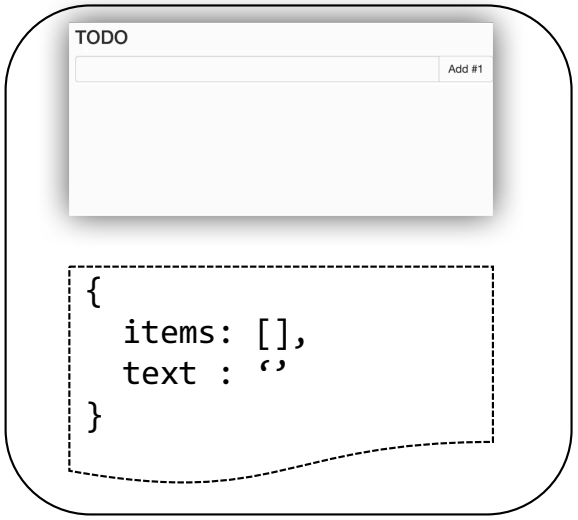


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        <form onSubmit={(e) => this.handleSubmit(e)} className="input-group">
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            className="form-control" value={this.state.text} />
          <span className="input-group-btn">
            <button className="btn btn-default">
              {'Add #' + (this.state.items.length + 1)}
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          </span>
        </form>
      </div>
    );
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}
```

React provides support for each of the possible events that might occur on a DOM element as an attribute that can be assigned a function.

If the form receives a **submit** event (a button was pushed) we want to handle the submission.

```
class TodoList extends React.Component {
  render() {
    return (
      <ul>
        {this.props.items.map(item => (
          <li key={item.id}>{item.text}</li>
        ))}
      </ul>
    );
  }
}
```

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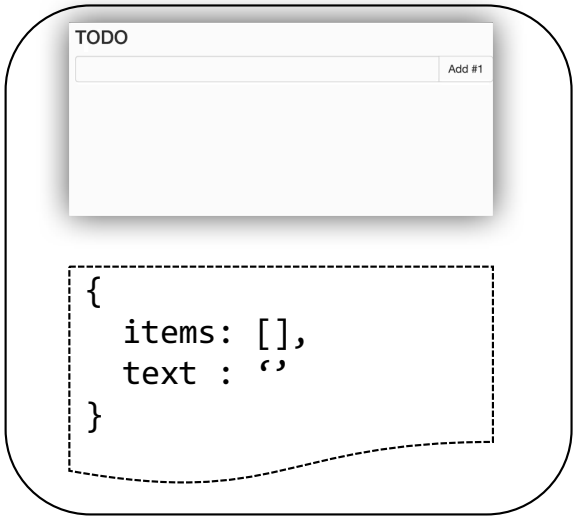
A ToDo List Application




```
import React from 'react';

export default class TodoApp extends React.Component {
  constructor(props) {
    super(props);
    this.state = {items: [], text: ''};
  }

  render() {
    return (
      <div>
        <h3>TODO</h3>
        <TodoList items={this.state.items} />
        <form onSubmit={(e) => this.handleSubmit(e)}>
          <input onChange={(e) => this.handleChange(e)}
            className="form-control" value={this.state.text} />
          <span className="input-group-btn">
            <button className="btn btn-default">
              {'Add #' + (this.state.items.length + 1)}
            </button>
          </span>
        </form>
      </div>
    );
  }

  handleChange(e) {
    this.setState({text: e.target.value});
  }

  handleSubmit(e) {
    e.preventDefault();
    var newItem = {
      text: this.state.text,
      id: Date.now()
    };
    this.setState((prevState) => ({
      items: prevState.items.concat(newItem),
      text: ''
    }));
  }
}
```

React provides support for each of the possible events that might occur on a DOM element as an attribute that can be assigned a function.

If the form receives a **submit** event (a button was pushed) we want to handle the submission.

We indicate this by creating a new anonymous function that receives an event object *e* and calls the **handleSubmit** method defined by the TodoApp component.

Why do we need an anonymous => function?

```
class TodoList extends React.Component {
  render() {
    return (
      <ul>
        {this.props.items.map(item => (
          <li key={item.id}>{item.text}</li>
        ))}
      </ul>
    );
  }
}
```

```
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```

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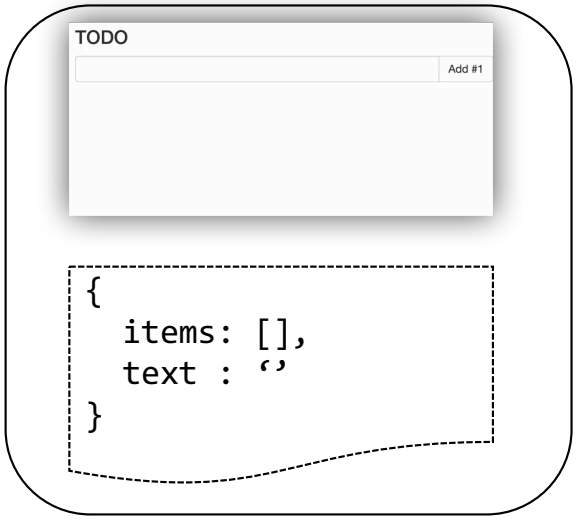


```
import React from 'react';

export default class TodoApp extends React.Component {
  constructor(props) {
    super(props);
    this.state = {items: [], text: ''};
  }

  render() {
    return (
      <div>
        <h3>TODO</h3>
        <TodoList items={this.state.items} />
        <form onSubmit={(e) => this.handleSubmit(e)} classN
          <input onChange={(e) => this.handleChange(e)}
            className="form-control" value={this.state.text} />
          <span className="input-group-btn">
            <button className="btn btn-default">
              {'Add #' + (this.state.items.length + 1)}
            </button>
          </span>
        </form>
      </div>
    );
  }

  handleChange(e) {
    this.setState({text: e.target.value});
  }

  handleSubmit(e) {
    e.preventDefault();
    var newItem = {
      text: this.state.text,
      id: Date.now()
    };
    this.setState((prevState) => ({
      items: prevState.items.concat(newItem),
      text: ''
    }));
  }
}
```

Likewise, If there is a change to the text input we want to update the internal state of the component to reflect what is currently displayed in the input box.

We do this by capturing a **change** event on the input text box. We once again create an anonymous => function that calls the **handleChange** method of the TodoApp component.

```
class TodoList extends React.Component {
  render() {
    return (
      <ul>
        {this.props.items.map(item => (
          <li key={item.id}>{item.text}</li>
        ))}
      </ul>
    );
  }
}
```

```
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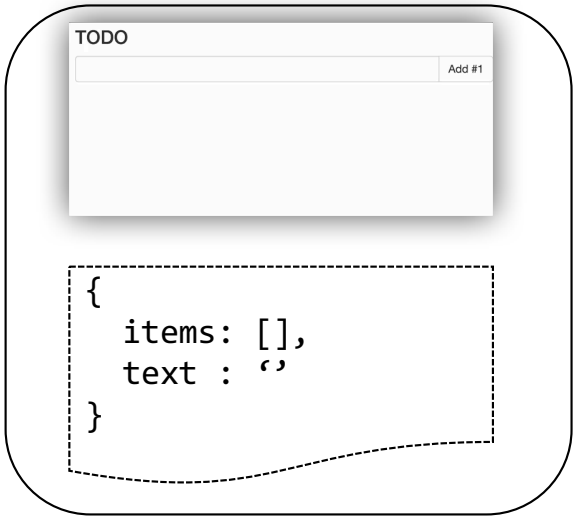


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import React from 'react';

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    super(props);
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  }

  render() {
    return (
      <div>
        <h3>TODO</h3>
        <TodoList items={this.state.items} />
        <form onSubmit={(e) => this.handleSubmit(e)} classN
          <input onChange={(e) => this.handleChange(e)}
            className="form-control" value={this.state.text} />
          <span className="input-group-btn">
            <button className="btn btn-default">
              {'Add #' + (this.state.items.length + 1)}
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    );
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      text: this.state.text,
      id: Date.now()
    };
    this.setState((prevState) => ({
      items: prevState.items.concat(newItem),
      text: ''
    }));
  }
}
```

NOTE: You are not invoking these functions *here*.

This code creates two new functions that are to be called when each of the corresponding events occurs.

This is the standard way to associate behavior and functionality of an application to parts of a UI.

```
class TodoList extends React.Component {
  render() {
    return (
      <ul>
        {this.props.items.map(item => (
          <li key={item.id}>{item.text}</li>
        ))}
      </ul>
    );
  }
}
```

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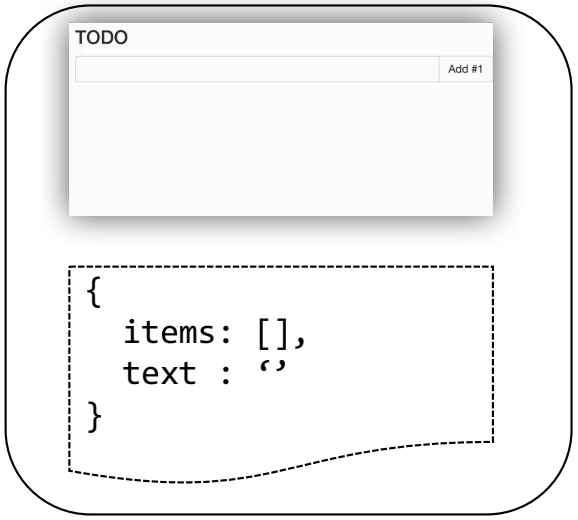


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            <button className="btn btn-default">
              {'Add #' + (this.state.items.length + 1)}
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    );
  }

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    var newItem = {
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      id: Date.now()
    };
    this.setState((prevState) => ({
      items: prevState.items.concat(newItem),
      text: ''
    }));
  }
}
```

We also update the view to reflect the current **state** of the TodoApp component.

In this case, we set the value of the input box to be the value of the state’s *text* property.

```
class TodoList extends React.Component {
  render() {
    return (
      <ul>
        {this.props.items.map(item => (
          <li key={item.id}>{item.text}</li>
        ))}
      </ul>
    );
  }
}
```

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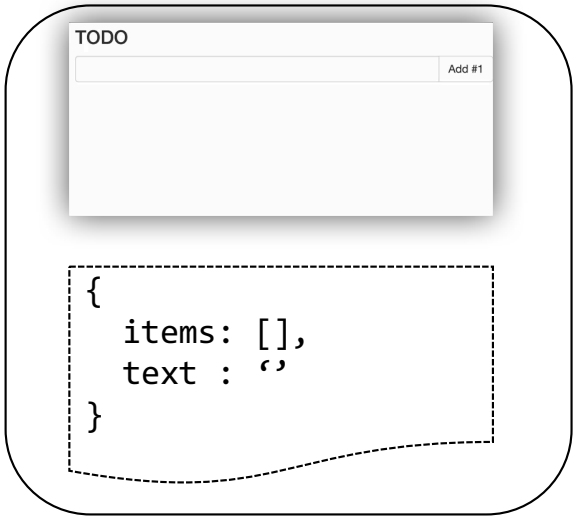


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    }));
  }
}
```

We also update the view to reflect the current **state** of the TodoApp component.

In this case, we set the value of the input box to be the value of the state’s *text* property.

We also set the button’s text value to indicate what the next item number it is you are adding.

```
class TodoList extends React.Component {
  render() {
    return (
      <ul>
        {this.props.items.map(item => (
          <li key={item.id}>{item.text}</li>
        ))}
      </ul>
    );
  }
}
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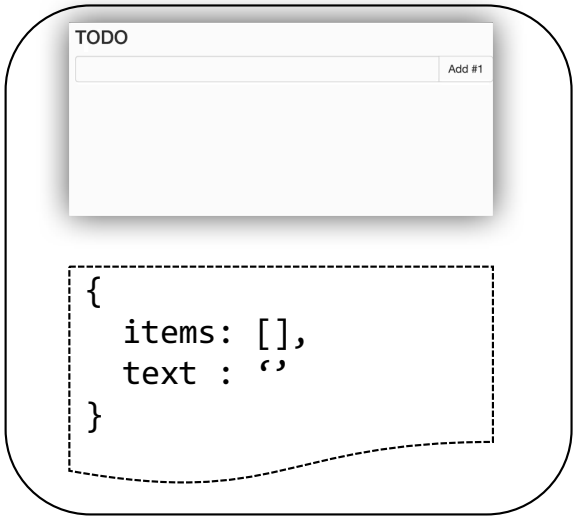


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```

So…

What do these functions do?

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class TodoList extends React.Component {
  render() {
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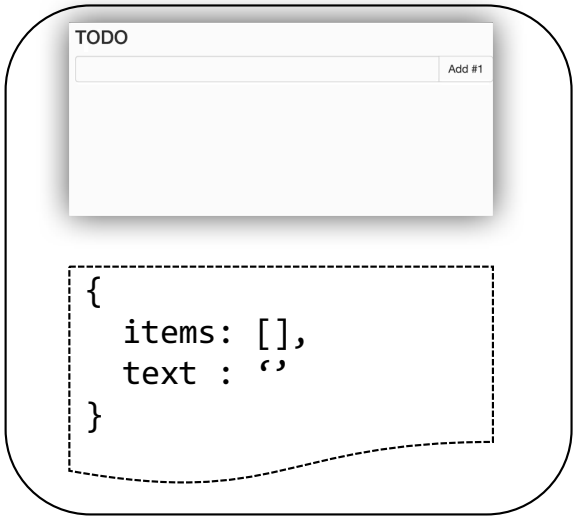


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}
```

So…

What do these functions do?

handleChange sets the state to be the current value of the DOM element (e.target) that received the event.

```
class TodoList extends React.Component {
  render() {
    return (
      <ul>
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        ))}
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}
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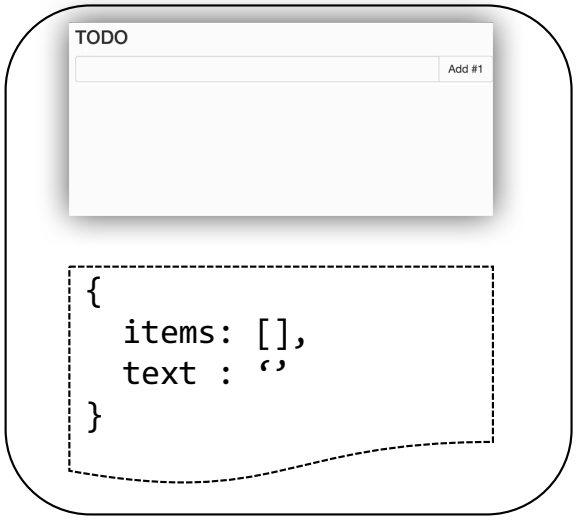


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export default class TodoApp extends React.Component {
  constructor(props) {
    super(props);
    this.state = {items: [], text: ''};
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  render() {
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      items: prevState.items.concat(newItem),
      text: ''
    }));
  }
}
```

So…

What do these functions do?

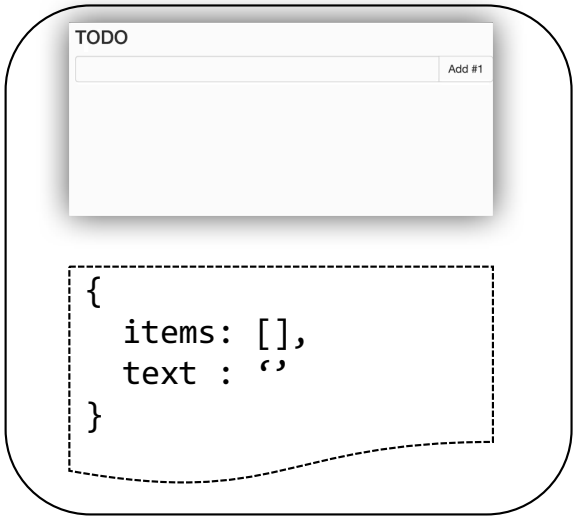
handleChange sets the state to be the current value of the DOM element (e.target) that received the event.

Because we set the state of the component it causes the **render** method to be invoked to re-render the component.

```
class TodoList extends React.Component {
  render() {
    return (
      <ul>
        {this.props.items.map(item => (
          <li key={item.id}>{item.text}</li>
        ))}
      </ul>
    );
  }
}
```

```
app
├── app.js
└── components
    ├── MarkdownEditor.js
    ├── Timer.js
    └── TodoList.js
```

A ToDo List Application




```
import React from 'react';

export default class TodoApp extends React.Component {
  constructor(props) {
    super(props);
    this.state = {items: [], text: ''};
  }

  render() {
    return (
      <div>
        <h3>TODO</h3>
        <TodoList items={this.state.items} />
        <form onSubmit={(e) => this.handleSubmit(e)} className="input-group">
          <input onChange={(e) => this.handleChange(e)}
            className="form-control" value={this.state.text} />
          <span className="input-group-btn">
            <button className="btn btn-default">
              {'Add #' + (this.state.items.length + 1)}
            </button>
          </span>
        </form>
      </div>
    );
  }

  handleChange(e) {
    this.setState({text: e.target.value});
  }

  handleSubmit(e) {
    e.preventDefault();
    var newItem = {
      text: this.state.text,
      id: Date.now()
    };
    this.setState((prevState) => ({
      items: prevState.items.concat(newItem),
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}
```

So…

What do these functions do?

handleSubmit will deal with adding a new item to the todo list application.

```
class TodoList extends React.Component {
  render() {
    return (
      <ul>
        {this.props.items.map(item => (
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        ))}
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}
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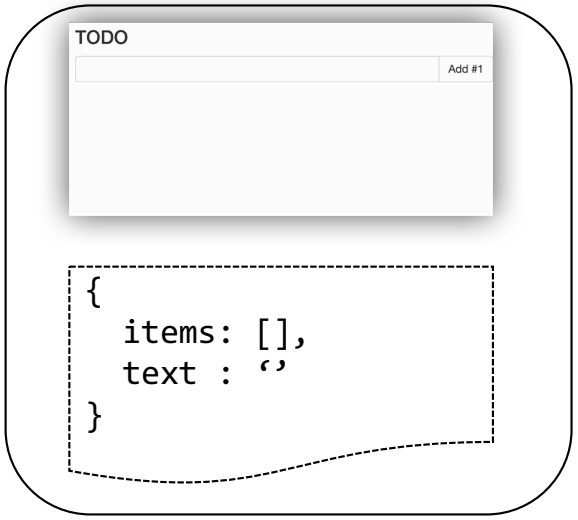


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What do these functions do?

handleSubmit will deal with adding a new item to the todo list application.

First, we call the **preventDefault**() method on the event object. **Why?**

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  render() {
    return (
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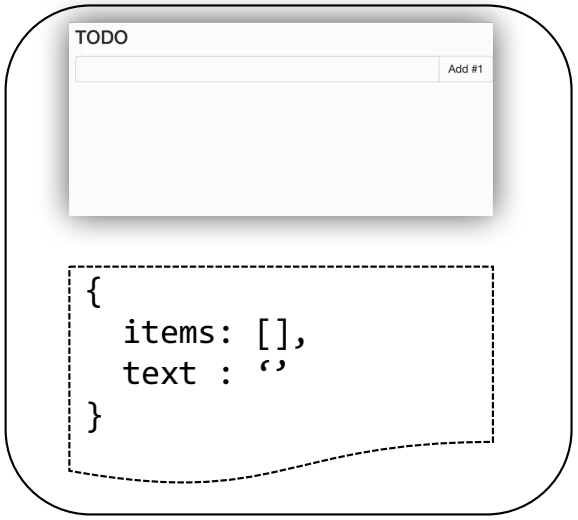


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So…

What do these functions do?

handleSubmit will deal with adding a new item to the todo list application.

First, we call the **preventDefault**() method on the event object. **Why?**

We then create the new todo list item as a JavaScript object literal.

```
class TodoList extends React.Component {
  render() {
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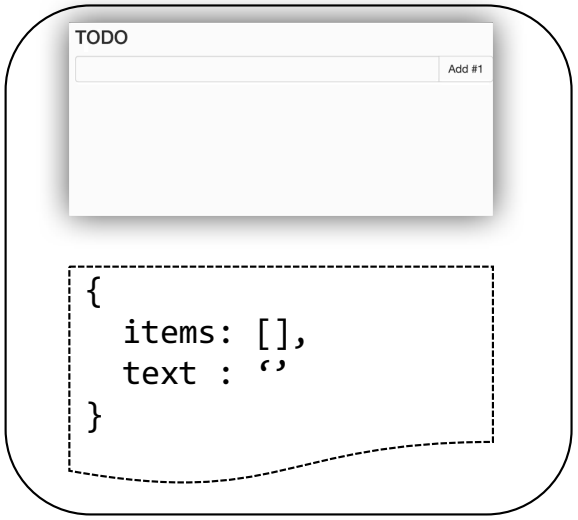


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So…

What do these functions do?

handleSubmit will deal with adding a new item to the todo list application.

First, we call the **preventDefault**() method on the event object. **Why?**

We then create the new todo list item as a JavaScript object literal.

Lastly, we set the state which indirectly causes **render** to be invoked to update the view.

```
class TodoList extends React.Component {
  render() {
    return (
      <ul>
        {this.props.items.map(item => (
          <li key={item.id}>{item.text}</li>
        ))}
      </ul>
    );
  }
}
```

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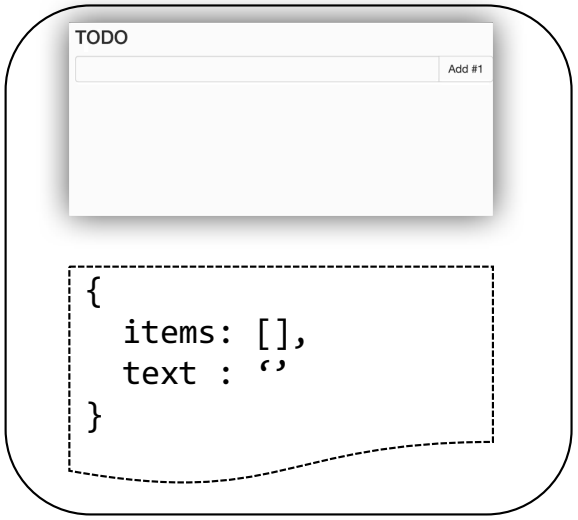


```jsx
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    }));
  }
}
```

The **render** method consists of two important parts:

- The **TodoList** component
  A separate component for managing and rendering the list of tasks

  So, what about this line?

```jsx
class TodoList extends React.Component {
  render() {
    return (
      <ul>
        {this.props.items.map(item => (
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        ))}
      </ul>
    );
  }
}
```

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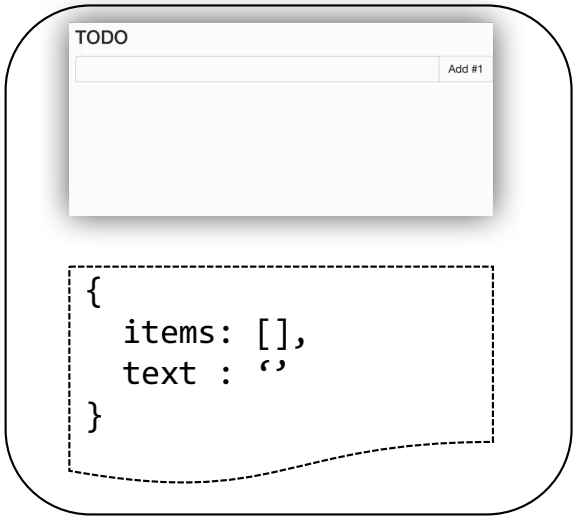


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      <ul>
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        ))}
      </ul>
    );
  }
}
```

```
    );
  }

  handle
    this
  }

  handleSubmit(e) {
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    }));
  }
}
```

The **render** method consists of two important parts:

- The **TodoList** component
  A separate component for managing and rendering the list of tasks

  So, what about this line?

- The TodoList component receives the list of items and iterates over them to produce the list of items currently in the todo list.

  Why do we not use React’s Children Map function?

```
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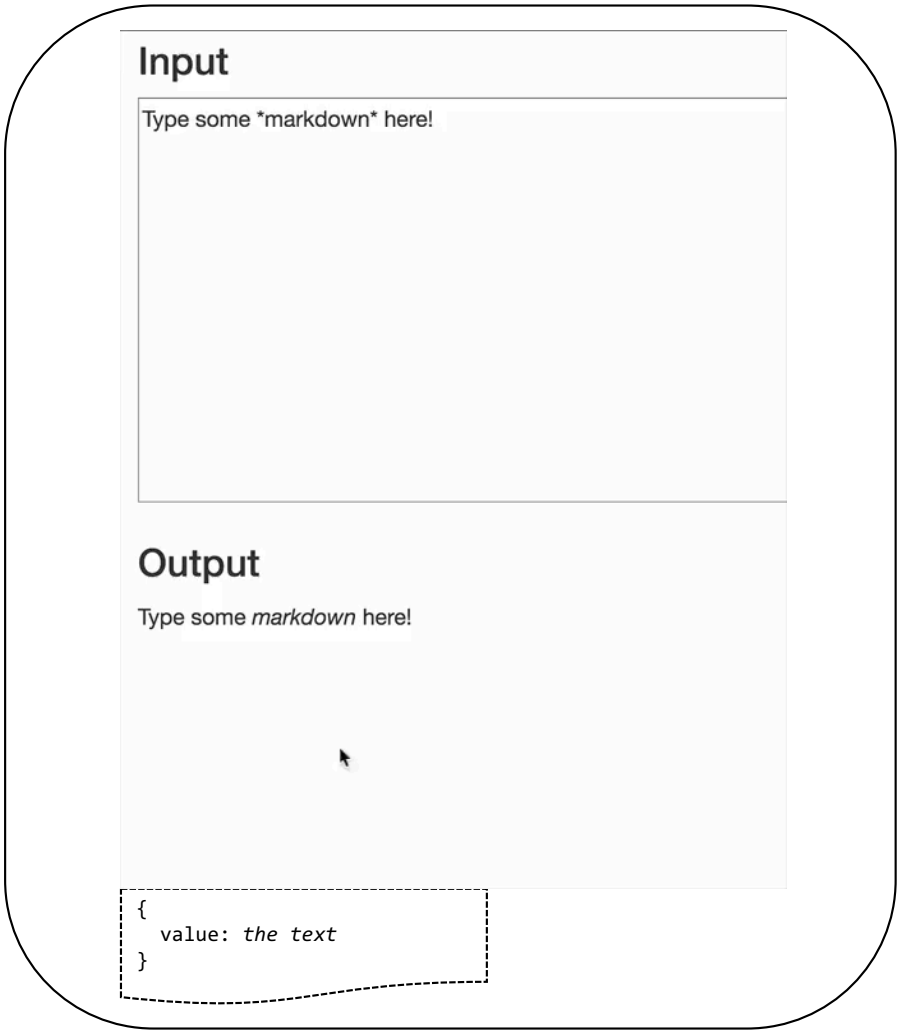
```

A Markdown Editor Application




```
import React from 'react';
import Markdown from 'react-remarkable';

export default class MarkdownEditor extends React.Component {
  constructor(props) {
    super(props);
    this.state = {value: 'Type some *markdown* here!'};
  }

  handleChange() {
    this.setState({value: this.refs.textarea.value});
  }

  render() {
    return (
      <div className="MarkdownEditor">
        <h3>Input</h3>
        <textarea
          onChange={() => this.handleChange()}
          cols="100"
          ref="textarea"
          defaultValue={this.state.value} />
        <h3>Output</h3>
        <Markdown source={this.state.value}/>
      </div>
    );
  }
}
```