**Regular Expressions and Pattern Matching**

**1. Basics – Literals and Simple Matches**

* **Pattern:** cat  
  **Matches:** "cat", "concatenate", "bobcat"  
  **Idea:** Regex will find the exact sequence of characters.

**2. Character Sets []**

* **Pattern:** [aeiou]  
  **Matches:** any single vowel.
* **Pattern:** [0-9]  
  **Matches:** any single digit.
* **Pattern:** [A-Z]  
  **Matches:** any single uppercase letter.
* **Pattern:** [a-zA-Z]  
  **Matches:** any alphabet letter (uppercase or lowercase).

**3. Negated Character Sets [^ ]**

* **Pattern:** [^0-9]  
  **Matches:** any character that is **not** a digit.

**4. Predefined Character Classes**

* \d → digit (same as [0-9])
* \D → non-digit
* \w → word character (letters, digits, underscore)
* \W → non-word character
* \s → whitespace (space, tab, newline)
* \S → non-whitespace

**5. Quantifiers**

* a+ → one or more a
* a\* → zero or more a
* a? → zero or one a
* a{3} → exactly 3 a
* a{2,5} → between 2 and 5 a
* a{2,} → 2 or more a

**6. Anchors**

* ^cat → matches "cat" only at the **start** of a string
* cat$ → matches "cat" only at the **end** of a string

**7. Alternation |**

* cat|dog → matches "cat" or "dog"

**8. Groups and Capturing**

* (ab)+ → matches "ab", "abab", "ababab", etc.
* Useful for extracting parts of text:  
  Example: (\d{3})-(\d{2}) on "123-45" captures "123" and "45" separately.

**9. Escaping Special Characters**

* If you want to match ., ?, \*, +, etc., prefix with \  
  Example: \. matches a literal dot.

**10. Practical Examples for Students**

1. **Email validation**:

^[a-zA-Z0-9.\_%+-]+@[a-zA-Z0-9.-]+\.[a-zA-Z]{2,}$

1. **Mobile number (10 digits)**:

^\d{10}$

1. **Date (DD/MM/YYYY)**:

^\d{2}/\d{2}/\d{4}$

1. **Only alphabets**:

^[A-Za-z]+$

1. **Password (at least 8 chars, one uppercase, one digit, one special)**:

^(?=.\*[A-Z])(?=.\*\d)(?=.\*[@$!%\*?&])[A-Za-z\d@$!%\*?&]{8,}$