SELF ASSESSMENT TEST SOLUTIONS

1. (C)

2. (B)

3. (C)

4. (D)

5. (C)

6. $$\frac{2\sqrt{45} + 3\sqrt{20}}{2\sqrt{5}} = \frac{2\sqrt{9 \times 5} + 3\sqrt{4 \times 5}}{2\sqrt{5}}$$

$$= \frac{6\sqrt{5} + 6\sqrt{5}}{2\sqrt{5}} = \frac{12\sqrt{5}}{2\sqrt{5}} = 6, \text{ which is rational}$$

7. $144 = 2^4 \times 3^2$

$96 = 2^5 \times 3$

$54 = 2 \times 3^3$

$\therefore$ HCF $= 2 \times 3 = 6$

2	144
2	72
2	36
2	18
3	9
	3

2	96
2	48
2	24
2	12
2	6
	3

2	54
3	27
3	9
	3

8. The fundamental theorem of Arithmetic : Every composite number can be expressed as product of primes and this factorisation is unique apart from the order in which the prime factors occur.
If 5^n were to end with digit 2, the prime factorisation of 5^n should contain the prime 2. But 5^n can be written only as $(1 \times 5)^n$ i.e., only 1 and 5 are its factors. Hence by the uniqueness of fundamental theorem of Arithmetic, 2 is not a factor of 5^n. So 5^n cannot end with digit 2 for any natural number n.

9. Let us assume that $3\sqrt{7}$ is a rational number.

$\Rightarrow 3\sqrt{7} = \frac{a}{b}$, where a and b are co-primes.

$\Rightarrow \sqrt{7} = \frac{a}{3b}$

Since $\frac{a}{3b}$ is rational, $\sqrt{7}$ is also rational.

But we know that $\sqrt{7}$ is irrational and hence $3\sqrt{7}$ is also irrational.

10. Let us assume that $\sqrt{6} + \sqrt{2}$ is rational.

i.e., $\sqrt{6} + \sqrt{2} = \frac{p}{q}$, $q \neq 0$ where p and q are coprimes.

On squaring both sides, we have $(\sqrt{6} + \sqrt{2})^2 = \left(\frac{p}{q}\right)^2$

$$6 + 2 + 2\sqrt{6} \times \sqrt{2} = \frac{p^2}{q^2}$$

$$8 + 2\sqrt{12} = \frac{p^2}{q^2}$$

$$2\sqrt{12} = \frac{p^2}{q^2} - 8 = \frac{p^2 - 8q^2}{q^2}$$

$$\sqrt{12} = \frac{p^2 - 8q^2}{2q^2}$$

Since p and q are integers, $\frac{p^2 - 8q^2}{2q^2}$ is rational

$\Rightarrow \sqrt{12}$ is rational.

But by the method of contradiction, we have $\sqrt{12}$ is irrational.

So our assumption is wrong and $\sqrt{6} + \sqrt{2}$ is irrational