

Answers with Detailed Solutions

Section A

1. Answer: B. $0.1010010001\dots$ is non-terminating, non-recurring.
2. Answer: A. $(\sqrt{7} - \sqrt{5})(\sqrt{7} + \sqrt{5}) = 7 - 5 = 2$.
3. Answer: A. Denominator is $2^3 \cdot 5^2$, so terminating decimal.
4. Answer: B. $\frac{1}{\sqrt{2}} \times \frac{\sqrt{2}}{\sqrt{2}} = \frac{\sqrt{2}}{2}$.
5. Answer: B. $a^m \cdot a^n = a^{m+n} = a^{12}$, so $n = 7$.
6. Answer: B. $\sqrt{5} \approx 2.236$, $\sqrt{6} \approx 2.449$, so 2.3 lies between them.
7. Answer: B. Multiply by $\frac{\sqrt{5} + \sqrt{2}}{\sqrt{5} + \sqrt{2}}$: $\frac{\sqrt{5} + \sqrt{2}}{5 - 2} = \frac{\sqrt{5} + \sqrt{2}}{3}$.
8. Answer: B. $\frac{1}{13}$ is non-terminating recurring.

Section B

1. $\frac{35}{40} = \frac{7}{8}$; denominator 2^3 , so terminating.
2. Draw a right triangle with legs 2 and 2; hypotenuse $\sqrt{8}$, represent on number line.
3. $\frac{5}{\sqrt{3} + \sqrt{2}} \times \frac{\sqrt{3} - \sqrt{2}}{\sqrt{3} - \sqrt{2}} = \frac{5(\sqrt{3} - \sqrt{2})}{3 - 2} = 5(\sqrt{3} - \sqrt{2})$.
4. $x^2 = (\sqrt{3} + \sqrt{2})^2 = 3 + 2 + 2\sqrt{6} = 5 + 2\sqrt{6}$, so $x^2 - 10 = 2\sqrt{6} - 5$.
5. $2^{-4} + 2^2 + 2^0 = \frac{1}{16} + 4 + 1 = \frac{1}{16} + 5 = \frac{81}{16}$.
6. Denominator $2^3 \cdot 5^4$ contains only 2 and 5, so terminating.

Section C

1. Construct unit circle; extend line to represent $\sqrt{2}$, $\sqrt{3}$.
2. $\frac{3}{\sqrt{11} - \sqrt{7}} - \frac{3}{\sqrt{11} + \sqrt{7}} = \frac{3(\sqrt{11} + \sqrt{7})}{11 - 7} - \frac{3(\sqrt{11} - \sqrt{7})}{11 - 7}$
 $= \frac{3\sqrt{11} + 3\sqrt{7} - 3\sqrt{11} + 3\sqrt{7}}{4} = \frac{6\sqrt{7}}{4} = \frac{3\sqrt{7}}{2}$.
3. $25^{-2} = (5^2)^{-2} = 5^{-4}$, $125 = 5^3$. So expression $= \frac{5^4 \cdot 5^{-4} \cdot 5^3}{5^{-3}} = \frac{5^3}{5^{-3}} = 5^6 = 15625$.
4. Assume $\sqrt{11} = \frac{p}{q}$ with $\gcd(p, q) = 1$. Then $11q^2 = p^2$. So $11|p$. Let $p = 11k$, then $p^2 = 121k^2$, so $11q^2 = 121k^2 \implies q^2 = 11k^2$. Thus $11|q$. Contradiction since $\gcd(p, q) = 1$. Hence $\sqrt{11}$ is irrational.

Section D

1. Answer: C. $\frac{7}{22} = 0.\overline{318}$ is recurring.
2. Answer: A. π is irrational.
3. Answer: C. $\frac{1}{\sqrt{7}} \times \frac{\sqrt{7}}{\sqrt{7}} = \frac{\sqrt{7}}{7}$.
4. Answer: B. Right triangle with legs 2 and $\sqrt{6}$, hypotenuse $\sqrt{10}$.
5. Answer: B. $\frac{a^m}{a^n} = a^{m-n}$.