7-8B Lesson Master

SKILLS Objective A
In 1–14, evaluate in your head.

1. $125^{\frac{4}{3}}$
2. $36^{\frac{3}{2}}$
3. $64^{\frac{4}{3}}$
4. $100^{\frac{3}{2}}$
5. $625^{\frac{1}{4}}$
6. $81^{\frac{3}{4}}$
7. $(\frac{25}{49})^{\frac{3}{2}}$
8. $(\frac{1}{27})^{-\frac{1}{3}}$
9. $6 \cdot 32^{\frac{4}{5}}$
10. $9.3 \cdot 10,000^{-\frac{1}{2}}$
11. $4 \cdot 16^{\frac{3}{4}}$
12. $(8^{\frac{4}{125}})^{\frac{1}{3}}$
13. $8 \cdot 128^{-\frac{5}{7}}$
14. $(\frac{1}{32})^{-\frac{2}{5}}$

SKILLS Objective B
In 15–24, simplify the expression and write without negative exponents. Assume all variables represent positive numbers.

15. $\frac{-15x^2y^{\frac{2}{3}}}{5x^{-\frac{1}{2}}y^{\frac{1}{3}}}$
16. $(m^2n^4)^{\frac{3}{4}}$
17. $\frac{a^{\frac{1}{2}}}{b}$
18. $(\frac{1}{h})^{\frac{3}{4}}$
19. $e^{\frac{3}{2}}$
20. $(r^3)^{\frac{3}{8}}$
21. $v^{-\frac{1}{2}} \cdot w^3$
22. $x^{-\frac{3}{2}} y^4$
23. $a^{\frac{4}{3}}$
24. $\frac{-20xy^{-\frac{1}{2}}}{4x^3y^{-\frac{3}{4}}}$
25. Solve for $x$: $b^{\frac{4}{3}} \cdot b^{\frac{1}{6}} = b^x$
26. Solve for $y$: $c^{\frac{3}{8}} \cdot c^{\frac{5}{2}} = c^y$
27. Solve for $z$: $d^{\frac{3}{2}} \cdot d^z = d^{\frac{1}{4}}$

SKILLS Objective D
In 28–33, solve the equation by hand.

28. $y^{\frac{2}{3}} = 16$
29. $w^{-\frac{8}{5}} = 256$
30. $6v^{-5} = 1458$
31. $9p^{\frac{1}{3}} = 45$
32. $m^{\frac{3}{3}} + 5 = 14$
33. $2y^{\frac{4}{3}} - 4 = 28$

Questions on SPUR Objectives
**PROPERTIES**  
Objective E

34. Fill in the Blank If \( y^\frac{5}{6} = 32 \), then \( y^\frac{5}{6} = \) __________.

**True or False** In 35 and 36, determine whether the statement is true or false.

35. If \( 0 < k < 1 \), then \( k^\frac{2}{3} > k \).

36. If \( k > 1 \), then \( k^\frac{5}{4} > k \).

37. Place in order from least to greatest if \( x > 1 \): \( x^{-3}, x, x^\frac{5}{4}, x^{-\frac{1}{2}} \).

38. Place in order from least to greatest if \( 0 < y < 1 \): \( y^3, y^\frac{4}{3}, y^{-\frac{3}{4}}, y^\frac{2}{3} \).

39. Multiple Choice Which expression(s) below are equivalent to \( a^\frac{p}{q} \)?

   A. \( \frac{1}{a^\frac{p}{q}} \)  
   B. \( (a^{-\frac{p}{q}})^q \)  
   C. \( (a^{-\frac{p}{q}})^q \)  
   D. \( (\frac{1}{a^\frac{p}{q}})^q \)  
   E. \( ((a^{-\frac{p}{q}})^q)^{-\frac{1}{2}} \)  
   F. \( (\frac{1}{a^\frac{p}{q}})^q \)

**USES**  
Objective F

40. Suppose the formula \( N = 150,000 \left( \frac{25}{9} \right)^{\frac{1}{4}} - t \) models the predicted decline in sales of a specific item over the next 24 months, where \( t \) is the time in months and \( N \) is the number of items sold per month. Will the company sell 54,000 items 13 months from now? Explain your reasoning.

41. Carbon 14 dating is used to estimate the age of a fossil less than approximately 50,000 years old. When an organism dies, the Carbon 14, or \( ^{14}\text{C} \), in the organism decomposes at a constant rate. The amount of \( ^{14}\text{C} \) is reduced to half in about 5730 years. The amount of \( ^{14}\text{C} \) is reduced to the fraction \( \frac{1}{2} \) after \( x \) years. Approximately what fraction of a living organism’s \( ^{14}\text{C} \) is left after the given time period? Express the answer as a percent rounded to the nearest tenth.

   a. 2865 years  
   b. 5730 years  
   c. 25,000 years  
   d. 50,000 years