

MR. MATT AND DR. TOI
ACADEMIC SUPPORT PROGRAMS

RULES OF EXPONENTS
INDEPENDENT PRACTICE
PROBLEMS

INTRODUCTORY PRACTICE PROBLEMS

INSTRUCTIONS: SIMPLIFY THE FOLLOWING EXPRESSIONS, BUT LEAVE EXPONENTS IN YOUR ANSWER (EXPONENTIAL FORM). YOU DO NOT NEED TO CALCULATE THE EXACT (EXPLICIT) NUMBER; FOR EXAMPLE, PROBLEM NUMBER 1 IS SIMPLIFIED CORRECTLY FOR YOUR REFERENCE.

1) $3^4 \times 3^5 =$

Solution: $3^{(4+5)} = 3^9$

2) $8^{10} \times 8^7$

3) $136^5 \times 136$

4) $7^6 \times 7^3$

5) $101^5 \times 101^9$

6) $\frac{8^{15}}{8^{13}}$

7) $\frac{10^5}{10^2}$

8) $\frac{19^{61}}{19^{54}}$

9) $51^{42} \div 51^{36}$

10) $23^{12} \div 23$

11) $(5^3)^{10}$

12) $(6^2)^7$

13) $(15^4)^3$

14) $(15^3)^4$

15) $(53^6)^6$

INSTRUCTIONS: SOLVE THE FOLLOWING EQUATIONS FOR X;
YOUR ANSWER SHOULD BE A NUMBER. FOR EXAMPLE,
PROBLEM NUMBER 16 IS SOLVED CORRECTLY.

16) $3^x = 3^4$

Solution: $x = 4$

17) $4^{11} = 4^x$

18) $7^{3x} = 7^9$

19) $8^{4x} = 8^8$

20) $13^{4x-1} = 13^{11}$

INSTRUCTIONS: CALCULATE THE FOLLOWING NUMERIC VALUES. YOUR ANSWERS SHOULD NOT HAVE EXPONENTS, AND DO NOT USE A CALCULATOR.

21) 3^2

22) 2^4

23) 1^{19}

24) 0^{31}

25) 17^1

26) 25^0

27) 3^{-2}

28) $81^{\frac{1}{2}}$

29) $2^2 + 2^2$

30) $5^2 + 3^3$

INTERMEDIATE PRACTICE PROBLEMS

SIMPLIFY THE FOLLOWING EXPRESSIONS, BUT LEAVE EXPONENTS IN YOUR ANSWER (EXPONENTIAL FORM). YOU DO NOT NEED TO CALCULATE THE EXACT (EXPLICIT) NUMBER; FOR EXAMPLE, PROBLEM NUMBER 31 IS SIMPLIFIED CORRECTLY FOR YOUR REFERENCE.

31) $5^8 \times 5^{-3} =$

Solution: $5^{8+(-3)} = 5^5$

32) $2^{10} \times 2^{-4}$

33) $8^{\frac{3}{2}} \times 8^{\frac{1}{2}}$

34) $10^{\frac{11}{4}} \times 10^{\frac{5}{4}}$

35) $7^{\frac{3}{4}} \times 7^{-\frac{1}{4}}$

36) $(17^{-1})^{-1}$

37) $(13^{-2})^{-10}$

38) $(5^{\frac{1}{2}})^{\frac{1}{3}}$

39) $(6^{\frac{1}{2}})^{\frac{3}{4}}$

40) $(3^{\frac{2}{3}})^{\frac{3}{2}}$

41) $3^2 \times 9^4$

42) $5^3 \times 25^5$

43) $16^{\frac{1}{3}} \times 4^{\frac{4}{3}}$

44) $8^3 \times 2^4$

45) $27^5 \div 3^3$

INSTRUCTIONS: SOLVE THE FOLLOWING EQUATIONS FOR X;
YOUR ANSWER SHOULD BE A NUMBER. FOR EXAMPLE,
PROBLEM NUMBER 46 IS SOLVED CORRECTLY.

46) $3^{x+3} = 9^2$

Solution: $3^{x+3} = (3^2)^2$
 $3^{x+3} = 3^4$
 $X + 3 = 4$
 $X = 1$

47) $4^{2x-6} = 16^4$

48) $5^{3x+1} = 25^{x+1}$

49) $\frac{3^{21}}{3^x} = 3^{15}$

50) $12^x \times 12^3 = 12^6$

INSTRUCTIONS: CALCULATE THE FOLLOWING NUMERIC VALUES. YOUR ANSWERS SHOULD NOT HAVE EXPONENTS, AND DO NOT USE A CALCULATOR.

51) $4^{\frac{3}{2}}$

52) $8^{\frac{-2}{3}}$

53) $8^{-\frac{4}{3}}$

54) $1^{-\frac{3}{5}}$

55) $(0^{305})^{207}$

56) $103^4 \times 103^{-4}$

57) $18^{305} \div 18^{304}$

58) $4^{56} \div 4^{54}$

59) $(1^{46})^{22}$

60) $17^{35} \times 17^{-34}$

ADVANCED PRACTICE PROBLEMS

INSTRUCTIONS: SIMPLIFY THE FOLLOWING EXPRESSIONS, BUT LEAVE EXPONENTS IN YOUR ANSWER (EXPONENTIAL FORM). YOU DO NOT NEED TO CALCULATE THE EXACT (EXPLICIT) NUMBER; FOR EXAMPLE, PROBLEM NUMBER 61 IS SIMPLIFIED CORRECTLY FOR YOUR REFERENCE.

61) $3^x \times 3^y =$

Solution: 3^{x+y}

62) $1^{53} \times 1^{27}$

63) $14^x \div 14^y$

64) $15^{3x} \times 15^2$

65) $(7^{2x})^3$

$$66) \quad (5^x)^x$$

$$67) \quad \frac{3^5 x 3^8}{3^{10}}$$

$$68) \quad \frac{3^x \times 3^y}{3^2}$$

$$69) \quad \frac{(8^3)^5 \times (8^5)^3}{8^{20}}$$

$$70) \quad \frac{17^8 \times 17^9}{17^{-5}}$$

$$71) \quad 7^{(x)} \times (7^x)^2$$

$$72) \quad 19 \times 19^x \div 19^y$$

73) $18^{\frac{1}{x}} \times 18^{\frac{3}{x}} \times 18^4$

74) $8^3 \times 2 \times 16^4$

75) $9^5 \times 27^3 \times 18^4$

INSTRUCTIONS: SOLVE THE FOLLOWING EQUATIONS FOR X;
YOUR ANSWER SHOULD BE A NUMBER. FOR EXAMPLE,
PROBLEM NUMBER 13 IS SOLVED CORRECTLY.

76) $5^x \times 5^3 = 5^7 \div 5$

$$\begin{aligned} 5^{x+3} &= 5^{7-1} \\ 5^{x+3} &= 5^6 \\ x+3 &= 6 \\ x &= 3 \end{aligned}$$

77) $3^x \times 9 = 3^{10} \div 27^2$

78) $6^{\sqrt{x}} = 36^2 \times 6^{2\sqrt{x}}$

79) $2^3 \times 4^x = 8^3 \times 16^4$

80) $4^2 \times 8^x = 16^{10}$

81) $27^2 \times 9^x = 81^7$

INSTRUCTIONS: CALCULATE THE FOLLOWING NUMERIC VALUES. YOUR ANSWERS SHOULD NOT HAVE EXPONENTS, AND DO NOT USE A CALCULATOR.

82) $16^{\frac{1}{2}} \times 4^5 \div 4^3$

83) $152^{-x} \times 152^x$

84) $133^{x+1} \div 133^x$

85) $81 \div 3^7$

86) $19 \div 19$

87) $(14^{\frac{1}{x}})^x$

88) $(26^{-x})^{\frac{1}{x}}$

89) $15^0 \times 15^1$

90) $27^{\frac{3}{3}} + 16^{\frac{8}{4}}$