

EXPONENTS

A POSITIVE EXPONENTS

A.1 WRITING REPEATED MULTIPLICATION IN EXPONENT FORM

Ex 1: Write in exponent form:

$$2 \times 2 \times 2 = \square$$

Ex 2: Write in exponent form:

$$3 \times 3 \times 3 \times 3 = \square$$

Ex 3: Write in exponent form:

$$5 \times 5 = \square$$

Ex 4: Write in exponent form:

$$7 \times 7 \times 7 = \square$$

Ex 5: Write in exponent form:

$$10 \times 10 \times 10 \times 10 \times 10 = \square$$

A.2 WRITING IN EXPONENT FORM FROM VERBAL EXPRESSIONS

Ex 6: Write in exponent form:

$$2 \text{ raised to the power } 3 = \square$$

Ex 7: Write in exponent form:

$$5 \text{ raised to the power } 2 = \square$$

Ex 8: Write in exponent form:

$$7 \text{ raised to the power } 4 = \square$$

Ex 9: Write in exponent form:

$$10 \text{ raised to the power } 5 = \square$$

A.3 CALCULATING POWERS

Ex 10: Evaluate the power:

$$2^3 = \square$$

Ex 11: Evaluate the power:

$$5^2 = \square$$

Ex 12: Evaluate the power:

$$3^4 = \square$$

Ex 13: Evaluate the power:

$$10^3 = \square$$

A.4 EXPRESSING NUMBERS IN EXPONENT FORM

Ex 14: Write in exponent form:

$$8 = \square$$

Ex 15: Write in exponent form:

$$27 = \square$$

Ex 16: Write in exponent form:

$$16 = \square$$

Ex 17: Write in exponent form:

$$100 = \square$$

A.5 INTERPRETING POWERS

MCQ 18: Determine if the following statement is True or False:

$$2^3 = 2 + 2 + 2$$

☐ True

☐ False

MCQ 19: Determine if the following statement is True or False:

$$3^2 = 2 \times 2 \times 2$$

☐ True

☐ False

MCQ 20: Determine if the following statement is True or False:

$$4^3 = 4 \times 4 \times 4$$

☐ True

☐ False

MCQ 21: Determine if the following statement is True or False:

$$3 \times 4 = 4 + 4 + 4$$

☐ True

☐ False

MCQ 22: Determine if the following statement is True or False:

$$3^2 = 2 \times 2 \times 2$$

☐ True

☐ False

A.6 EVALUATING EXPRESSIONS WITH POWERS

Ex 23: Evaluate the expression:

$$2^3 \times 3^2 = \boxed{}$$

Ex 24: Evaluate the expression:

$$3^2 \times 10^2 = \boxed{}$$

Ex 25: Evaluate the expression:

$$6 \times 10^3 = \boxed{}$$

Ex 26: Evaluate the expression:

$$2.5 \times 10^2 = \boxed{}$$

A.7 CHECKING EQUALITY BETWEEN PRODUCTS AND POWERS

MCQ 27: Determine if the following statement is True or False:

$$2 \times 2 \times 3 \times 3 = 2^4$$

☐ True

☐ False

MCQ 28: Determine if the following statement is True or False:

$$2 \times 2 \times 2 = 3^2$$

☐ True

☐ False

MCQ 29: Determine if the following statement is True or False:

$$2 \times 3 \times 2 \times 3 = 2^2 \times 3^2$$

☐ True

☐ False

MCQ 30: Determine if the following statement is True or False:

$$5 \times 5 \times 5 \times 4 = 5^3 \times 2^2$$

☐ True

☐ False

A.8 WRITING REPEATED MULTIPLICATION OF AN ALGEBRAIC EXPRESSION IN EXPONENT FORM

Ex 31: Write in exponent form:

$$x \times x \times x = \boxed{}$$

Ex 32: Write in exponent form:

$$x \times x = \boxed{}$$

MCQ 33: Which expressions are equal to x ?

Choose all answers that apply:

☐ x^2

☐ x^1

☐ 1

Ex 34: Write in exponent form:

$$x \times x \times x \times x = \boxed{}$$

A.9 WRITING ALGEBRAIC EXPRESSIONS IN EXPONENT FORM FROM VERBAL DESCRIPTIONS

Ex 35: Write in exponent form:

$$x \text{ squared} = \boxed{}$$

Ex 36: Write in exponent form:

$$x \text{ to the power of 4} = \boxed{}$$

Ex 37: Write in exponent form:

$$x \text{ cubed} = \boxed{}$$

Ex 38: Write in exponent form:

$$x \text{ to the power of 5} = \boxed{}$$

B NEGATIVE EXPONENTS

B.1 WRITING NEGATIVE EXPONENTS AS FRACTIONS

Ex 39: Write as a fraction:

$$3^{-2} = \boxed{}$$

Ex 40: Write as a fraction:

$$10^{-3} = \boxed{}$$

Ex 41: Write as a fraction:

$$2^{-1} = \boxed{}$$

Ex 42: Write as a fraction:

$$5^{-2} = \boxed{}$$

B.2 WRITING FRACTIONS AS NEGATIVE EXPONENTS

Ex 43: Write using a negative exponent:

$$\frac{1}{4} = \boxed{}$$

Ex 44: Write using a negative exponent:

$$\frac{1}{27} = \boxed{}$$

Ex 45: Write using a negative exponent:

$$\frac{1}{1000} = \boxed{}$$

Ex 46: Write using a negative exponent:

$$\frac{1}{25} = \boxed{}$$

C RATIONAL EXPONENTS

C.1 EXPRESSING ROOTS USING EXPONENTS

Ex 47: Write in exponent form:

$$\sqrt{3} = \boxed{}$$

Ex 48: Write in exponent form:

$$\frac{1}{\sqrt{7}} = \boxed{}$$

Ex 49: Write in exponent form:

$$\sqrt{7} = \boxed{}$$

Ex 50: Write in exponent form:

$$\frac{1}{\sqrt{3}} = \boxed{}$$

Ex 51: Write in exponent form:

$$\sqrt{x} = \boxed{}$$

C.2 CALCULATING POWERS AND ROUNDING

Ex 52:  Calculate:

$$3^{\frac{1}{2}} = \boxed{} \text{ (rounded to 2 decimal places)}$$

Ex 53:  Calculate:

$$2^{\frac{1}{2}} = \boxed{} \text{ (rounded to 2 decimal places)}$$

Ex 54:  Calculate:

$$2^{-\frac{1}{2}} = \boxed{} \text{ (rounded to 2 decimal places)}$$

Ex 55:  Calculate:

$$100^{-\frac{1}{2}} = \boxed{} \text{ (rounded to 2 decimal places)}$$

D EXPONENT LAW 1

D.1 SIMPLIFYING PRODUCTS OF POWERS

Ex 56: Simplify:

$$7^3 \times 7^2 = \boxed{}$$

Ex 57: Simplify:

$$2^4 \times 2^3 = \boxed{}$$

Ex 58: Simplify:

$$3^5 \times 3^2 = \boxed{}$$

Ex 59: Simplify:

$$10^6 \times 10^2 = \boxed{}$$

Ex 60: Simplify:

$$2^3 \times 2 = \boxed{}$$

Ex 61: Simplify:

$$3 \times 3^4 = \boxed{}$$

D.2 SIMPLIFYING PRODUCTS OF ALGEBRAIC POWERS

Ex 62: Simplify:

$$x^2 \times x^3 = \boxed{}$$

Ex 63: Simplify:

$$x \times x^2 = \boxed{}$$

Ex 64: Simplify:

$$x^2 \times x^2 = \boxed{}$$

Ex 65: Simplify:

$$x^3 \times x = \boxed{}$$

D.3 IDENTIFYING CORRECT EXPONENTIAL EXPRESSIONS

MCQ 66: Which expressions are equal to $2^2 + 2^1$?

Choose all answers that apply:

☐ 6

☐ 2^3

☐ 4^3

MCQ 67: Which expressions are equal to $5^2 \times 5^1$?

Choose all answers that apply:

- ☐ 25
☐ 125
☐ 5³

MCQ 68: Which expressions are equal to $3^2 + 3^1$?

Choose all answers that apply:

- ☐ 12
☐ 3³
☐ 9³



MCQ 69: Which expressions are equal to $4^3 \times 4^2$?

Choose all answers that apply:

- ☐ 4⁵
☐ 64
☐ 1024

D.4 SIMPLIFYING EXPRESSIONS OF POWERS

Ex 70: Simplify:

$$x^{-2} x^3 = \square$$

Ex 71: Simplify:

$$2^2 2^{-3} 2^{-3} = \square$$

Ex 72: Simplify:

$$x x^3 x^{-2} = \square$$

Ex 73: Simplify:

$$x^3 \times x^{-3} = \square$$

E EXPONENT LAW 2

E.1 SIMPLIFYING FRACTIONS OF POWERS

Ex 74: Simplify:

$$\frac{7^5}{7^2} = \square$$

Ex 75: Simplify:

$$\frac{5^6}{5^4} = \square$$

Ex 76: Simplify:

$$\frac{2^3}{2^5} = \square$$

Ex 77: Simplify:

$$\frac{3}{3^5} = \square$$

Ex 78: Simplify:

$$\frac{7^2}{7^6} = \square$$

E.2 SIMPLIFYING FRACTIONS OF ALGEBRAIC POWERS

Ex 79: Simplify:

$$\frac{x^5}{x^2} = \square$$

Ex 80: Simplify:

$$\frac{x^6}{x^4} = \square$$

Ex 81: Simplify:

$$\frac{x^3}{x^5} = \square$$

Ex 82: Simplify:

$$\frac{x}{x^5} = \square$$

Ex 83: Simplify:

$$\frac{x^2}{x^6} = \square$$

F EXPONENT LAW 3

F.1 SIMPLIFYING POWERS OF POWERS

Ex 84: Simplify:

$$(5^2)^3 = \square$$

Ex 85: Simplify:

$$(7^3)^2 = \square$$

Ex 86: Simplify:

$$(3^2)^4 = \square$$

Ex 87: Simplify:

$$(2^5)^2 = \square$$

F.2 SIMPLIFYING POWERS OF POWERS

Ex 88: Simplify:

$$(x^2)^3 = \square$$

Ex 89: Simplify:

$$(x^3)^2 = \square$$

Ex 90: Simplify:

$$(x^2)^4 = \square$$

Ex 91: Simplify:

$$(x^5)^2 = \square$$

G EXPONENT LAW 4

G.1 SIMPLIFYING POWERS OF PRODUCTS

Ex 92: Simplify:

$$(3 \times 5)^2 = \boxed{}$$

Ex 93: Simplify:

$$(2 \times 3)^4 = \boxed{}$$

Ex 94: Simplify:

$$(3 \times 7)^3 = \boxed{}$$

Ex 95: Simplify:

$$(3 \times 5 \times 7)^2 = \boxed{}$$

G.2 SIMPLIFYING POWERS OF PRODUCTS

Ex 96: Simplify:

$$(2 \times x)^3 = \boxed{}$$

Ex 97: Simplify:

$$(x \times 3)^2 = \boxed{}$$

Ex 98: Simplify:

$$(5 \times x)^4 = \boxed{}$$

Ex 99: Simplify:

$$(x \times 2)^5 = \boxed{}$$

H EXPONENT LAW 5

H.1 SIMPLIFYING POWERS OF FRACTIONS

Ex 100: Simplify:

$$\left(\frac{5}{3}\right)^2 = \boxed{}$$

Ex 101: Simplify:

$$\left(\frac{2}{7}\right)^3 = \boxed{}$$

Ex 102: Simplify:

$$\left(\frac{1}{2}\right)^2 = \boxed{}$$

Ex 103: Simplify:

$$\left(\frac{1}{3}\right)^3 = \boxed{}$$

H.2 SIMPLIFYING POWERS OF ALGEBRAIC FRACTIONS

Ex 104: Simplify:

$$\left(\frac{x}{2}\right)^4 = \boxed{}$$

Ex 105: Simplify:

$$\left(\frac{1}{x}\right)^3 = \boxed{}$$

Ex 106: Simplify:

$$\left(\frac{2}{x}\right)^4 = \boxed{}$$

Ex 107: Simplify:

$$\left(\frac{x}{10}\right)^2 = \boxed{}$$

I EXPONENT LAW 6

I.1 EXPRESSING NEGATIVE EXPONENTS AS FRACTIONS

Ex 108: Write as a fraction:

$$\left(\frac{4}{7}\right)^{-1} = \boxed{}$$

Ex 109: Write as a fraction:

$$\left(\frac{5}{3}\right)^{-2} = \boxed{}$$

Ex 110: Write as a fraction:

$$\left(\frac{1}{2}\right)^{-3} = \boxed{}$$

Ex 111: Write as a fraction:

$$\left(\frac{2}{3}\right)^{-3} = \boxed{}$$

I.2 MULTIPLYING BY THE INVERSE

Ex 112: Simplify:

$$\frac{3}{2} \times \left(\frac{3}{2}\right)^{-1} = \boxed{}$$

Ex 113: Simplify:

$$\frac{x}{2} \times \left(\frac{x}{2}\right)^{-1} = \boxed{}$$

Ex 114: Simplify:

$$\frac{a}{b} \times \left(\frac{a}{b}\right)^{-1} = \boxed{}$$

J ORDER OF OPERATIONS

J.1 EVALUATING EXPRESSIONS WITH EXPONENTS IN 2 STEPS

Ex 115: Evaluate this expression:

$$2 \times 5^2 = \boxed{}$$

Ex 116: Evaluate this expression:

$$2^3 - 1 = \boxed{}$$

Ex 117: Evaluate this expression:

$$(2 + 1)^2 = \boxed{}$$

Ex 118: Evaluate this expression:

$$2^3 \div 4 = \boxed{}$$

Ex 119: Evaluate this expression:

$$(5 - 2)^2 = \boxed{}$$

J.2 EVALUATING EXPRESSIONS WITH EXPONENTS IN 3 STEPS

Ex 120: Evaluate this expression:

$$2^3 \times (8 - 6) = \boxed{}$$

Ex 121: Evaluate this expression:

$$(2 + 1)^2 - 1 = \boxed{}$$

Ex 122: Evaluate this expression:

$$(3^2 - 1) \times 4 = \boxed{}$$

Ex 123: Evaluate this expression:

$$\frac{3^2 - 1}{2} = \boxed{}$$

J.3 FINDING THE OPERATORS

Ex 124:



$$3^3 \begin{matrix} \square + \\ \square - \\ \square \times \\ \square \div \end{matrix} 2^2 = 23$$

Ex 125:



$$2^4 \begin{matrix} \square + \\ \square - \\ \square \times \\ \square \div \end{matrix} 3^2 = 144$$

Ex 126:



$$2^3 \begin{matrix} \square + \\ \square - \\ \square \times \\ \square \div \end{matrix} 4 = 2$$

Ex 127:



$$(2 + 1)^2 \begin{matrix} \square + \\ \square - \\ \square \times \\ \square \div \end{matrix} 1 = 10$$

J.4 COMBINING NEGATIVE POWERS WITH ARITHMETIC

Ex 128: Write as a fraction:

$$1 + 2^{-1} = \boxed{}$$

Ex 129: Write as a fraction:

$$3^{-1} - 1 = \boxed{}$$

Ex 130: Write as a fraction:

$$5 \times 3^{-2} = \boxed{}$$

Ex 131: Write as a fraction:

$$\frac{4}{5} \times 2^{-2} = \boxed{}$$

J.5 SIMPLIFYING ALGEBRAIC EXPRESSIONS

Ex 132: Simplify the expression:

$$2x^2 + 3x^2 = \boxed{}$$

Ex 133: Simplify the expression:

$$3x^2 - x^2 = \boxed{}$$

Ex 134: Simplify the expression:

$$2x^2 + 3x + x = \boxed{}$$

Ex 135: Simplify the expression:

$$x^2 + 2x + x^2 + 5x + 1 = \boxed{}$$

Ex 136: Simplify the expression:

$$3x^2 + 4 + 2x + x^2 + 6x + 1 = \boxed{}$$

Ex 137: Simplify the expression:

$$(2x - x)^2 = \boxed{}$$

J.6 SIMPLIFYING EXPRESSIONS OF POWERS

Ex 138: Simplify:

$$\frac{2^3}{2} \times 2^3 = \boxed{}$$

Ex 139: Simplify:

$$x^3 \times \frac{x^4}{x^2} = \boxed{}$$

Ex 140: Simplify:

$$\frac{x}{x^2} x^{-1} = \boxed{}$$

Ex 141: Simplify:

$$\frac{2^2}{2 \times 2^3} = \boxed{}$$

Ex 142: Simplify:

$$\left(\frac{x}{2}\right)^2 \times 4 = \boxed{}$$

Ex 143: Simplify:

$$\frac{x^3 \times (x^2)^2}{x^4} = \boxed{}$$

J.7 EVALUATING TO AN INTEGER

Ex 144: Express as an integer:

$$\sqrt{2} \times 2^{\frac{1}{2}} = \boxed{}$$

Ex 145: Express as an integer:

$$\frac{2^{\frac{3}{2}}}{\sqrt{2}} = \boxed{}$$

Ex 146: Express as an integer:

$$(\sqrt{2})^4 = \boxed{}$$

Ex 147: Express as an integer:

$$(3\sqrt{2})^2 = \boxed{}$$

K SCIENTIFIC NOTATION

K.1 WRITING NUMBERS AS POWERS OF TEN

Ex 148: Write in exponent form:

$$100 = \boxed{}$$

Ex 149: Write in exponent form:

$$1\,000 = \boxed{}$$

Ex 150: Write in exponent form:

$$0.01 = \boxed{}$$

Ex 151: Write in exponent form:

$$0.000\,1 = \boxed{}$$

K.2 EXPRESSING NUMBERS IN SCIENTIFIC NOTATION

Ex 152: Write in scientific notation:

$$123 = \boxed{} \times \boxed{}$$

Ex 153: Write in scientific notation:

$$1\,200 = \boxed{} \times \boxed{}$$

Ex 154: Write in scientific notation:

$$5\,000\,000 = \boxed{} \times \boxed{}$$

Ex 155: Write in scientific notation:

$$8\,100\,000\,000 = \boxed{} \times \boxed{}$$

Ex 156: Write in scientific notation:

$$0.05 = \boxed{} \times \boxed{}$$

Ex 157: Write in scientific notation:

$$0.12 = \boxed{} \times \boxed{}$$

Ex 158: Write in scientific notation:

$$0.000\,59 = \boxed{} \times \boxed{}$$

K.3 EXPRESSING IN DECIMAL FORM

Ex 159: Write in decimal form:

$$8.2 \times 10^2 = \boxed{}$$

Ex 160: Write in decimal form:

$$1.25 \times 10^3 = \boxed{}$$

Ex 161: Write in decimal form:

$$5 \times 10^6 = \boxed{}$$

Ex 162: Write in decimal form:

$$2 \times 10^{-2} = \boxed{}$$

Ex 163: Write in decimal form:

$$8.5 \times 10^{-1} = \boxed{}$$

Ex 164: Write in decimal form:

$$9.1 \times 10^{-5} = \boxed{}$$

K.4 EXPRESSING REAL-WORLD QUANTITIES IN SCIENTIFIC NOTATION

Ex 165: There are approximately 4 million red blood cells in a drop of blood. Write the quantity in scientific notation:

$$\boxed{} \times \boxed{} \text{ red blood cells}$$

Ex 166: There are approximately 3 billion stars in the galaxy. Write the quantity in scientific notation:

$$\boxed{} \times \boxed{} \text{ stars}$$

Ex 167: There are approximately 7.5 billion people on Earth. Write the quantity in scientific notation:

$$\boxed{} \times \boxed{} \text{ people}$$

Ex 168: The distance from the Earth to the Sun is approximately 150 million kilometers. Write the quantity in scientific notation:

$$\boxed{} \times \boxed{} \text{ kilometers}$$