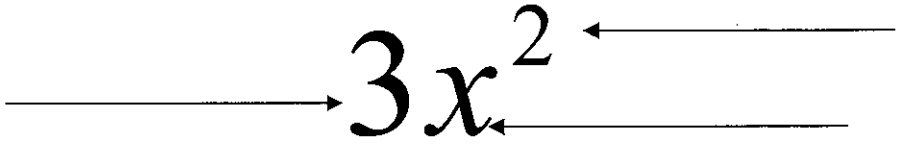
Chapter 2

Exponents, Properties, Expressions, Metric System & Scientific Notation

This packet belongs to _____

Exponents: Rules and properties



Rule 1: Anything to the zero power =

Rule 2: For every number a $\neq 0$, $a^m \cdot a^n =$

$9^8 = 3^?$ $\quad$ $8^5 = 2^?$ $\quad$ $2^{18} \cdot 8^6$

$4^{10} = 2^?$ $\quad$ $27^8 = 3^?$ $\quad$ $3^{51} \cdot 9^{22}$

$100^{15} = 10^?$ $\quad$ $64^{211} = 4^?$ $\quad$ $2^{240} \cdot 32^{12}$

Rule 3: For every number a $\neq 0$, $\frac{a^m}{a^n} =$

Basic Properties

Commutative Property

Addition and Multiplication are commutative: switching the order of two numbers being added or multiplied does not change the result.

Examples:

Associative Property

Addition and multiplication are associative: the order that numbers are grouped in addition and multiplication does not affect the result.

Examples:

Distributive Property

The distributive property of multiplication over addition: multiplication may be distributed over addition.

Examples:

The Zero Property of Addition

Adding 0 to a number leaves it unchanged. We call 0 the additive identity.

Example:

The Zero Property of Multiplication

Multiplying any number by 0 gives 0.

Example:

The Multiplicative Identity

We call 1 the multiplicative identity. Multiplying any number by 1 leaves the number unchanged.

Example:

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Practice for Lessons 2-4 and 2-5

Use the properties to simplify the expression. Name the property or properties used.

1. $3.5 + 12.4 + 0.5 + 1.6$ _____ _____ **(2-4)**

2. 13.05×0 _____ _____

3. $(31 \times 7) + (31 \times 3)$ _____ _____

4. $(7 \times 8) \times 5$ _____ _____

What value of the variable makes the statement true?

5. $7 + x = 7$ _____

6. $4.03 \times 33 = n \times 4.03$ _____

7. $9s = 9$ _____

8. $1.35 \times 0 = g$ _____

9. $(3 + 5.04) + 0.86 = 3 + (w + 0.86)$ _____

10. $6(7 + 6) = (d \times 7) + (d \times 6)$ _____

11. $(4 \times 1.3) + (4 \times 4.7) = 4m$ _____

2.5 Simplifying Expressions

Evaluate when a = 2.5, b = 3, c = 1.6 and d = 2

1) $a + 2b^3 - c$

2) $b(a - c)^2$

3) $[\,4a + 2(b - c)^2] \div 8$

4) $a^b c^{b+2}$

5) $(a^3 + b - 3c)^0$

6) $a^2 + bc$

7) $(2b)^2[(a + b) \div 11]$

2.5 Simplifying Expressions

1) $(6^2 + 34) \div 7$

2) $8 + 6 \bullet 5^2$

3) $4 + (2.7 \div 0.3^2)$

4) $4.2\,(7) - 1.1\,(2^3)$

5) $\dfrac{8.2 + 7.3 - 3.1(2)}{(7.9 + 4.5) \div 2^2}$

6) $\dfrac{(3.89 + 1.6)}{(14 \div 7)(5^2 - 4^2)}$

7) $3a^2 + (12 - 3^2)a^2$

8) $10k\,(k + 50) + [k^2 - (2 \bullet 5)^2 k + 6]$

9) $\dfrac{p(2 - t) - 3t(p - t + 4)}{p}$

The Metric system

Length

Main Unit _____ – _____

Other units

Kilometer _____

Centimeter _____

Millimeter _____

Example 1

How many meters are in 34 centimeters?

34 cm = _____ m

Start at centimeters & move the decimal

Direction _____ Places _____

Weight

Main Unit _____ – _____

Other units

Kilogram _____

Milligram _____

Example 2

How many centigrams are in 2.74 dekagrams?

2.74 dag = _____ cg

Start at deckagrams & move the decimal

Direction _____ Places _____

Capacity

Main Unit _____ – _____

Other units

Kiloliter _____

Milliliter _____

1) 7 km = _____ m

2) .08 hl = _____ cl

3) 26,000 m = _____ km

4) 3,478 mg = _____ dag

5) 6.56 cl = _____ dg

Metric Conversions

Name _____
Date _____

kilo	hecto	deka	unit	deci	centi	milli
(k)	(h)	(da)	(m/L/g)	(d)	(c)	(m)
1000	100	10	1	.1	.01	.001

* To convert to **smaller** units, move the decimal point to the **right**.
* To convert to **larger** units, move the decimal point to the **left**.

1.) 474 kg = _____cg

2.) .2 cL = _____mL

3.) .001 km = _____m

4.) .25 L = _____ dL

5.) 6.789 cm = _____ hm

6.) 11.3 cg = _____g

7.) 25 L = _____mL

8.) 81.5 cm = _____km

9.) 988.52 mm = _____hm

10) 23,500 mg = _____g

11) 2.6 kg = _____mg

12) 5 m = _____cm

13) 9.09 hL = _____cL

14) 50 m = _____km

15) 32 dag = _____cg

16) 4.5 mm = _____dam

Name _____ Date _____

Hidden Meters

Find three boxes horizontally, vertically, or diagonally whose sum is 1 meter. There are 16 such trios. Ring each trio you see. You may use a calculator.

90 mm	11 cm	0.8 m	500 mm	40 cm	25 cm	0.5 m	0.25 m
200 mm	50 dm	60 cm	1 dm	30 cm	9 mm	1 cm	0.8 m
40 cm	1 cm	700 mm	8 cm	5 cm	4 dm	550 mm	50 cm
400 mm	0.3 m	300 mm	3 dm	40 cm	0.3 m	0.4 cm	300 cm
2 dm	3 dm	40 mm	15 mm	1.1 m	300 mm	9 m	0.5 m
0.3 cm	1 m	30 cm	600 mm	1 dm	8 dm	20 cm	350 mm
50 cm	0.45 m	1 dm	45 cm	2.5 cm	0.1 m	9 dm	15 cm
200 mm	3 dm	50 cm	0.95 m	4 cm	3 cm	0.80 m	40 dm
10 mm	250 mm	600 dm	4.5 dm	0.07 m	600 mm	70 cm	300 mm

11.

Scientific Notation

Scientific Notation Keeping track of place value in very large or very small numbers written in standard form may be difficult. It is more efficient to write such numbers in scientific notation. A number is expressed in scientific notation when it is written as a product of two factors, one factor that is greater than or equal to 1 and less than 10 and one factor that is a power of ten.

Scientific Notation	A number is in scientific notation when it is in the form $a \times 10^n$, where $1 \leq a < 10$ and n is an integer.

Example 1 **Express 3.52×10^4 in standard notation.**

Example 2 **Express 6.21×10^{-5} in standard notation.**

Example 3 **Express 37,600,000 in scientific notation.**

Example 4 **Express 0.0000549 in scientific notation.**

Products and Quotients with Scientific Notation You can use properties of powers to compute with numbers written in scientific notation.

Example 1 **Evaluate $(6.7 \times 10^3)(2 \times 10^{-5})$. Express the result in scientific and standard notation.**

Example 2 **Evaluate $\frac{1.5088 \times 10^8}{4.1 \times 10^5}$. Express the result in scientific and standard notation.**

Scientific Notation

Part A: Express each of the following in standard form.

1. 9.65×10^{-4}

2. 6.452×10^{2}

3. 8.5×10^{-2}

4. 8.77×10^{-1}

5. 2.71×10^{4}

6. 6.4×10^{-3}

Part B: Express each of the following in scientific notation.

7. 78,000

8. 16

9. 0.00053×10^{6}

10. 0.0043

11. 250

12. 0.875×10^{-3}

Part C: Use the associative property to simplify. Express your final answer in scientific notation rounded to the nearest tenth.

13. $(6.02 \times 10^{23})(8.65 \times 10^{4})$

14. $\dfrac{(5.4 \times 10^{4})(2.2 \times 10^{7})}{4.5 \times 10^{5}}$

15. $(6.02 \times 10^{23})(9.63 \times 10^{-2})$

16. $\dfrac{(6.02 \times 10^{23})(-1.42 \times 10^{-15})}{6.54 \times 10^{-6}}$

17. $\dfrac{5.6 \times 10^{-18}}{8.9 \times 10^{8}}$

18. $\dfrac{(6.02 \times 10^{23})(-5.11 \times 10^{-27})}{-8.23 \times 10^{5}}$

19. $(-4.12 \times 10^{-4})(7.33 \times 10^{12})$

20. $\dfrac{(3.1 \times 10^{14})(4.4 \times 10^{-12})}{-6.6 \times 10^{-14}}$

21. A cubic millimeter of blood contains about 5×10^{6} red blood cells. An adult human body contains approximately 5×10^{6} cubic millimeters of blood. About how many red blood cells does a human body contain?

22. A liter of healthy human blood contains approximately 4×10^{9} white blood cells. A healthy adult contains about 5.5 liters of blood. How many more times red blood cells does a healthy adult have than white blood cells. *Refer to previous answer for the number of red blood cells.* Express your final answer rounded to the nearest tenth in scientific notation.

LESSON 11.8

Name _____ Date _____

Study Guide

For use with pages 626–632

GOAL **Find the probability that event A *or* event B occurs.**

VOCABULARY

Disjoint events, or **mutually exclusive events,** are events that have no outcomes in common. **Overlapping events** are events that have one or more outcomes in common.

Two events are **complementary events** if they are disjoint events and one event or the other must occur.

EXAMPLE 1 Identifying Disjoint and Overlapping Events

Tell whether the events are *disjoint* or *overlapping*.

a. Randomly select a number from 1 to 20.

Event A: Select an even number.
Event B: Select a number less than 2.

b. Randomly select a card from a 52-card deck.

Event A: Select an Ace.
Event B: Select a Club.

EXAMPLE 2 Finding the Probability of Disjoint Events

A bag of marbles contains 25 yellow marbles, 40 red marbles, 5 purple marbles, and 30 blue marbles. You randomly draw a marble from the bag. What is the probability that you draw a yellow or a purple marble?

LESSON 11.8 Continued

Name _____ Date _____

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EXAMPLE 3 Finding the Probability of Overlapping Events

You randomly choose a number from 1 to 30. What is the probability that you choose a prime number or a number greater than 20?

Exercises for Examples 1–3

You randomly choose a number from 1 to 20. For the specified events A and B, tell whether the events are *disjoint* or *overlapping*. Then find *P*(A or B).

1. **Event A:** Choose a number divisible by 5.
   Event B: Choose a number divisible by 3.
2. **Event A:** Choose a number divisible by 12.
   Event B: Choose a number divisible by 5.

EXAMPLE 4 Finding the Probability of Complementary Events

You spin a spinner. The probability that you spin red is $\frac{1}{3}$. What is the probability that you do *not* spin red?

Exercises for Example 4

Given *P*(A), find *P*(not A).

3. $P(\text{A}) = 44\%$
4. $P(\text{A}) = 0.01$
5. $P(\text{A}) = \frac{6}{7}$

15.

Name: _____

Disjoint vs. Overlapping Events

Decide whether the events are disjoint or overlapping. Explain your reasoning.

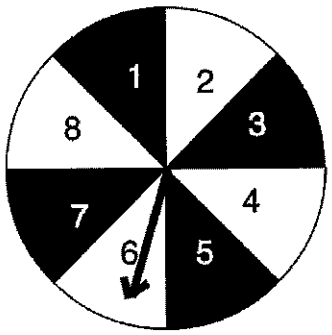
1.) Event A: picking a color Event B: Picking a number

2.) Event A: picking an even number Event B: picking a number less than 5.

3.) Event A: Picking a basketball player Event B: Picking a volleyball player

Find the probability of finding each situation. Use the spinner on the right.

4.) P(shaded number or number less than five)



5.) P(even number or a multiple of six)

6.) P(even number or shaded number)

7.) Fifty tickets are sold for a raffle. You buy two tickets and your friend buys three tickets. One ticket is randomly chosen as the winning ticket. What is the probability that you or your friend wins the raffle?

8.) A survey found that 19% of the population owned dogs, 14% owned cats, and 6% of the population owned both a cat and a dog. Find the probability that a random person owns a cat or a dog.

The following questions use a standard 52 card deck. There are four suits (spades, clubs, hearts, diamonds) and thirteen of each suit (2-10, jack, queen, king, ace). Find the probability of each circumstance:

9.) P(diamond or face card) *Ace counts as a face card*

10.) P(king or a red card)

11.) P(club or NOT a face card)

12.) P(number card or queen)

A die is rolled. Find each probability.

13) P(1 or 6) 14) P(even or prime) 15) P(multiple of 2 or multiple of 3)

Ten slips of paper are placed into a container. Each is labeled with a number from 1 through 10. Find the probability of choosing the following from the container.

16) P(multiple of 3) 17) P(prime or even) 18) P(perfect number or even)