New

Pioneers Graded Maths 6

Second Edition

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Contents

01 Place Values

Lesson 1 Place Value and Powers of Ten

We use exponents to write very large and very small numbers as powers of 10.

$10^5 = 10 \times 10 \times 10 \times 10 \times 10 = 100{,}000$

$10^{-4} = \frac{1}{10 \times 10 \times 10 \times 10} = \frac{1}{10{,}000} = 0.00001$

We also use powers of 10 to write numbers in expanded form.

$48{,}369 = (4 \times 10^4) + (8 \times 10^3) + (3 \times 10^2) + (6 \times 10^1) + (9 \times 10^0)$

$0.018 = (1 \times 10^{-2}) + (8 \times 10^{-3})$

Write each number in expanded form, using powers of 10.

7,000 .....

43,000,000 .....

0.00028 .....

48,002 .....

Write each number in standard form.

$(6 \times 10^2) + (7 \times 10^0) =$ .....

$(2 \times 10^{-4}) + (2 \times 10^{-3}) =$ .....

$(7 \times 10^5) + (9 \times 10^2) + (4 \times 10^{-2}) =$ .....

$(5 \times 10^{-3}) + (7 \times 10^{-4}) + (1 \times 10^{-2}) =$ .....

Find a pattern in each sequence of numbers.
Use the pattern to find the missing terms.

$10^1, 10^3, 10^5,$ ....., ..., ...

$2^{-1}, 4^{-3}, 6^{-5},$ ....., ..., ...

Lesson 2

Comparing and Ordering Numbers

Different Ways to Compare Numbers

You can use a number line.

Since 0.35 is to the right of 0.345,

$0.35 > 0.345$

You can compare digits.

Align the decimal points and compare digits from left to right.

0.35
0.345

$5 > 4$

$0.35 > 0.345$

Compare using >, < or =.

0.09 ◯ 0.090

45,298,402 ◯ 45,299,204

30.583 ◯ 3.0583

Order the numbers from least to greatest.

1,245,735 12,245,735 124,735 0.0037 0.307 0.037

Lesson 3

Rounding and Estimating Numbers

Different Ways to Estimate Sums and Differences

Use front-end estimation.

Add or subtract the digits in the greatest place.

$$\begin{array}{r} 8.59 \\ +\ 6.25 \\ \hline 14 \end{array}$$

Adjust.

Add or subtract at the digits in the next greatest place.

$$\begin{array}{r} 8.59 \\ +\ 6.25 \\ \hline 14.7 \end{array}$$

Use rounding rules.

Round to the nearest whole number. Then add or subtract.

$$\begin{array}{rcr} 8.59 & \rightarrow & 9 \\ +\ 6.25 & \rightarrow & +\ 6 \\ \hline & & 15 \end{array}$$

Round each number to the underlined place.

245,958,873 197.4732 22.0896

Estimate each sum or difference. Identify the method you used.

8.21 − 5.33= 7.09 + 3.54 + 4.21=

Adding and Subtracting Whole Numbers and Decimals

Find 54.2+315.6

$$\begin{array}{r} 54.2 \\ +\ 315.6 \\ \hline 369.8 \end{array}$$

Align the decimal points.

Find 15.72−6.4

$$\begin{array}{r} 15.72 \\ -\ 6.40 \\ \hline 9.32 \end{array}$$

Find 3,851+38

$$\begin{array}{r} 3{,}851 \\ +\ 38 \\ \hline 3{,}889 \end{array}$$

Align the digits by place value.

Find each sum or difference. Show your work.

1.4572 − 0.731=

4.697 + 8.29=

14,659 + 925=

4,157 + 1,790=

2.067 − 1.15=

179.2 + 14.85=

51.64 − 7.9=

Lesson 5

Variables and Expressions

phrase: 6 less than 19 increased by 3.6

numerical expression: 19 − 6 + 3.6

phrase: the sum of 13 and 8 decreased by 9

numerical expression: 13 + 8 − 9

Write a numerical expression to represent each phrase.

11 more than 6.2 plus 5

.....

9 less than 14.6 increased by 8

.....

7 less than 55 increased by 23

.....

3.5 more than 42 decreased by 15

.....

6.4 less than 12 plus 17

.....

7.6 more than 9 increased by 2.3

.....

Choose the expression that correctly represents each situation.

Team A won the game with a score of 96.
Team B scored W points.
How many more points did Team A score?

a. 96 + w= b. 96 − w= c. w − 96=

Sara invited 14 friends to her party.
She also invited S people from her family.
How many people did she invite in all?

a. 14 − S= b. S − 14= c. S + 14=

Lesson 6

Using Addition Properties

Commutative Property	Associative Property	Identity Property
$8 + 3 = 3 + 8$	$(6 + 7) + 2 = 6 + (7 + 2)$	$5 + 0 = 5$
$a + b = b + a$	$(a + b) + c = a + (b + c)$	$a + 0 = a$

Estimate. Identify the property or properties you used.

$5.63 + 0 + 11 =$

.....

$45 + 9.4 + 55 =$

.....

$72 + (a + 19) =$, given $a = 28$

.....

$28 + 59 + c =$, given $c = 12$

.....

$31 + b + 44 =$, given $b = 0$

.....

$26 + s + 64 =$, given $s = 5$

.....

$78.1 + m + 1.9 =$, given $m = 3$

.....

Use >, < or = to make each statement true.

$9.3 + (14 + 3.6) \bigcirc (9.3 + 14) + 3.6$

$87 + b + 42 \bigcirc 87 + b + 24$

$(16.8 + 23) + 4 \bigcirc 18.6 + (23 + 4)$

Lesson 7

Estimating Products and Quotients

Three Ways to Estimate a Product

Estimate 39×53

Round to the greatest place.

$$\begin{array}{r} 39 \\ \times\ 53 \\ \hline \end{array} \qquad \begin{array}{r} 40 \\ \times\ 50 \\ \hline 2{,}000 \end{array}$$

Round up to overestimate.

$$\begin{array}{r} 39 \\ \times\ 53 \\ \hline \end{array} \qquad \begin{array}{r} 40 \\ \times\ 60 \\ \hline 2{,}400 \end{array}$$

Use front-end estimation to underestimate.

$$\begin{array}{r} 39 \\ \times\ 53 \\ \hline \end{array} \qquad \begin{array}{r} 30 \\ \times\ 50 \\ \hline 1{,}500 \end{array}$$

Two Ways to Estimate a Quotient

Estimate $5{,}237 \div 64$

Underestimate

$$60\overline{)5000} \quad 80$$

Overestimate

$$70\overline{)5{,}000} \quad 71$$

Estimate each product or quotient. Identify the method you used.

$56 \times 82 =$

$19\overline{)785}$

$58 \times 657 =$

$32\overline{)1{,}566}$

$512 \times 87 =$

$84\overline{)5{,}585}$

$616 \times 279 =$

$24\overline{)4{,}850}$

$691 \times 525 =$

$47\overline{)2{,}754}$

$8{,}298 \times 53 =$

$53\overline{)5{,}581}$

Lesson 8 Multiplying Whole Numbers

Find 56 × 36

Step 1

Multiply the ones.
Regroup if necessary.

$$\begin{array}{r} {\scriptstyle 3}\\ 56\\ \times\ 36\\ \hline 336 \end{array}$$

Step 2

Multiply the tens.
Regroup if necessary.

$$\begin{array}{r} {\scriptstyle 1}\\ 56\\ \times\ 36\\ \hline 336\\ 1680 \end{array}$$

Step 3

Add the partial products.

$$\begin{array}{r} 56\\ \times\ 36\\ \hline 336\\ 1680\\ \hline 2016 \end{array}$$

Find each product. Estimate to see if your answer is reasonable. Show your work.

$$\begin{array}{r} 57\\ \times\ 48\\ \hline \end{array} \qquad \begin{array}{r} 39\\ \times\ 62\\ \hline \end{array} \qquad \begin{array}{r} 245\\ \times\ 12\\ \hline \end{array} \qquad \begin{array}{r} 496\\ \times\ 53\\ \hline \end{array}$$

$$\begin{array}{r} 391\\ \times\ 255\\ \hline \end{array} \qquad \begin{array}{r} 662\\ \times\ 124\\ \hline \end{array} \qquad \begin{array}{r} 3{,}755\\ \times\ 732\\ \hline \end{array}$$

2,583 × 39=

838 × 134=

3,502 × 85=

02 Operations

Lesson 1 Order of Operations

1. Always perform any operations in parentheses first.
2. Rewrite any exponents as whole numbers.
3. Multiply and divide from left to right.
4. Add and subtract from left to right.

Evaluate. Follow the order of operations.

$6 + 7 \times 9 =$

$5^2 \times 4 \div 2 - (8 - 3) =$

Evaluate each expression given q = 3, r = 5, an s = 9.

$s \div (q + 0) =$ $q \times s \div q =$ $r^2 - (s + q) =$

$(q \times r) + s^2 \div q =$ $r \times s - q \times r =$ $q + (s - r)^2 =$

Insert parentheses to make each equation true.

$10 \times 4 + 3^2 = 49$ $6 \times 10 - 7 \times 5 = 90$

$100 \div 4 \times 8 - 3 = 125$ $4 \times 7 + 5 - 8 = 40$

Lesson 2

Using Multiplication Properties

Commutative Property	Associative Property	Identity Property
$15 \times 4 = 4 \times 15$	$7 \times (8 \times 3) = (7 \times 8) \times 3$	$25 \times 1 = 25$
$a \times b = b \times a$	$a \times (b \times c) = (a \times b) \times c$	$a \times 1 = a$

Zero Property	Distributive Property
$14 \times 0 = 0$	$9 \times (10+7) = (9 \times 10) + (9 \times 7)$
$A \times 0 = 0$	$a \times (b + c) = (a \times b) + (a \times c)$

Use properties to complete. Identify each property.

$(21 \times 5) \times 2 = \square \times (5 \times 2)$

.....

$(17 \times 12) + (\square \times 8) = 17 \times (12+8)$

.....

$4 \times 13 \times 2 = 4 \times \square \times 13$

.....

$9 \times (14 \times 1) = 9 \times \square$

.....

Estimate each expression given a = 4.2, b = 18, and c = 12.

$(b \times c) \times 0 =$

.....

$(c \times 3) + (c \times 7) =$

.....

$2b \times 4 =$

.....

$3\ (a + 5.6) =$

.....

Compare using >, < or =.

$4.6(m+n) \bigcirc 2.5m + 2.5n$

$(7 \times 6) + 15 \bigcirc (7 \times 15) + (6 \times 15)$

$(5 \times 9) + 7 \bigcirc (5 \times 7) + (9 \times 7)$

$(p \times 3) - (p \times r) \bigcirc p\ (3 - r)$

Lesson 3 Using Mental Math to Solve Equations

Rasha made 32 bracelets. She sold 13 bracelets. How many bracelets are left?

Use a model.

Total bracelets made: 32	
Bracelets sold: 13	Bracelets left: ?

What number should I subtract to get 13?

$32 - 19 = 13$

Solution: Nineteen bracelets are left.

Use an equation.

Let b represent the bracelets that are left.

$13 + b = 32$

Use mental math to solve.

$13 + 19 = 32$

$b = 19$

Use mental math to solve each equation.

$a + 8 = 32$ ....

$b \times 6 = 42$ ....

$51 \div m = 17$ ....

$7 \times r = 63$ ....

$91 - y = 75$ ....

$n \div 2 = 11$ ....

$13 \times s = 52$ ....

$38 + c = 55$ ....

$t - 43 = 26$ ....

$p + 111 = 111$ ....

$m - 29 = 95$ ....

$200 \div f = 8$ ....

Determine whether each solution is reasonable. Write reasonable or unreasonable. Explain your reasoning.

$15b = 15;\ b = 0$ ....

$85 \div 5 = r;\ r = 17$ ....

$231 - m = 132;\ m = 99$ ....

$325 + n = 500;\ n = 75$ ....

03 Divisibility

Lesson 1 Divisibility Rules

- A number is divisible by 2 if its last digit is even.
- A number is divisible by 3 if the sum of its digits is divisible by 3.
- A number is divisible by 4 if its last two digits are divisible by 4.
- A number is divisible by 5 if its last digit is 0 or 5.
- A number is divisible by 6 if it is divisible by both 2 and 3.
- A number is divisible by 9 if the sum of its digits is divisible by 9.
- A number is divisible by 10 if its last digit is 0.

Determine whether the number in black is divisible by the number in red. Write yes or no.

295 3	495 10	12,312 6	1,265 5	3,014 4
....	....	....	....	....
873 9	3,105 9	4,521 3	7,138 2	14,670 6
....	....	....	....	....

Complete the table. Write yes or no.

	45	2,385	1,827	100	925	432	555
Divisible by 4?							
Divisible by 5?							
Divisible by 20?							

Lesson 2 Prime and Composite Numbers

Is the number 36 prime or composite?

Begin by trying to divide 36 by each number, starting with 1.

List the results that show pairs of factors. Stop when a factor is repeated.

$36 \div 1 = 36$, so 1 and 36 are factors

$36 \div 2 = 18$, so 2 and 18 are factors

$36 \div 3 = 12$, so 3 and 12 are factors

$36 \div 4 = 9$, so 4 and 9 are factors

$36 \div 6 = 6$, so 6 is a factor

Since 36 has the factors 1, 2, 3, 4, 6, 9, 12, 18 and 36, it is a composite number.

List all factors of each number. Then identify the number as prime or composite.

33	87	40
94	51	37
76	79	61

Lesson 3

Prime Factorization

Find the prime factorization of 20.

Step 1

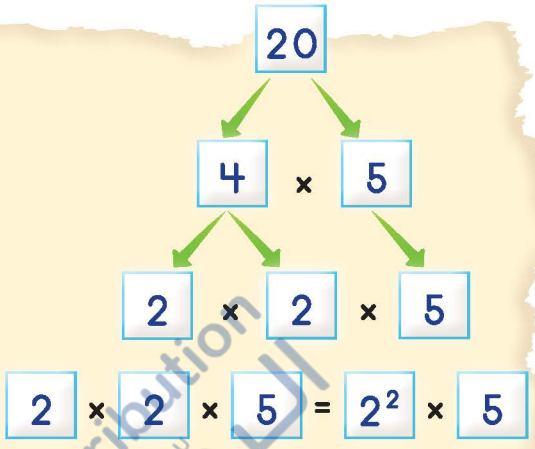
Start with two factors of 20.

Step 2

if a factor is composite, find its factors.

Step 3

Check that all factors are prime numbers.



The prime factorization of 20 is 2 × 2 × 5.

Write each prime factorization using exponents.

$2 \times 2 \times 2 \times 3 \times 5 =$ .....

$2 \times 3 \times 3 \times 3 \times 5 \times 5 =$ .....

Write each problem as a product of factors, then find the product.

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

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

Draw a factor tree on a separate sheet to show the prime factorization of each, then rewrite using exponents.

50

67

Complete each factor tree for the number 60.