Lesson 50

Note: Students will need a calculator with π function for exercise 2.

Exercise 1

EXPONENTS

In Groups

— Textbook practice —

a. Open your textbook to lesson 50, part 1. √

- (Teacher reference:)

$10 \times 10 \times 10 \times 10 \times 10 = 10^6$ $(10 \times 10) \times (10 \times 10 \times 10 \times 10) = 10^6$ $10^2 \times 10^4 = 10^6$
$10 \times 10 \times 10 \times 10 \times 10 \times 10 = 10^6$ $(10 \times 10 \times 10) \times (10 \times 10 \times 10) = 10^6$ $10^3 \times 10^3 = 10^6$

- You've learned how to express repeated multiplication as a base and exponent.

b. The first equation shows a set of 10s.

- What's the base? (Signal.) *10.*
  The base is 10. The base is shown 6 times.
- So what's the exponent? (Signal.) *6.*
  So the whole set is 10^6.

c. Below is the same set of 10s in 2 groups. The groups are **multiplied** together. How many 10s are multiplied in the first group? (Signal.) *2.*
  So that group equals 10^2.

- Say the base and exponent for that group. (Signal.) *10^2.*
- Look at the next group. √
  How many 10s are in the second group? (Signal.) *4.*
- Say the base and exponent for that group. (Signal.) *10^4.*
  So another way to show 10^6 is 10^2 times 10^4.
- What's another way of showing 10^6? (Signal.) *$10^2 \times 10^4$.*
- (Repeat step c until firm.)

d. The next box shows the same set of 10s in different groups.

- How many 10s are in the first group? (Signal.) *3.*
  Say the base and exponent for that group. (Signal.) *10^3.*
- How many 10s are in the other group? (Signal.) *3.*
  Say the base and the exponent for that group. (Signal.) *10^3.*
- So $10^3 \times 10^3 = 10^6$.
- What's another way of showing 10^6? (Signal.) *$10^3 \times 10^3$.*

e. So if the base number is shown 6 times, the exponents must add up to 6.

f. If the base is shown 6 times, what must the exponents add up to? (Signal.) *6.*

- If the base is shown 9 times, what must the exponents add up to? (Signal.) *9.*
- If the base is shown 5 times, what must the exponents add up to? (Signal.) *5.*
- (Repeat step f until firm.)

— Textbook practice —

a. Find part 2. √

- For each item, you'll write the complete equation with exponents.

b. Problem A. The multiplication shows 8 seven times.

- Say the base and exponent for all the 8s. (Signal.) *8^7.*
  So no matter how the 8s are multiplied together, the exponents must add up to 7.
- You can see the groups set off with parentheses.
- Touch the first group. √
  Tell me the base and exponent you'll write for the first group. (Signal.) *8^2.*
- Next group.
  Tell me the base and exponent. (Signal.) *8^3.*
- Last group.
- Tell me the base and exponent. (Signal.) *8^2.*
- The exponents are 2 and 3 and 2. Do the exponents add up to 7? (Signal.) *Yes.*
- So the whole equation is $8^7 = 8^2 \times 8^3 \times 8^2$.

c. Say the equation. (Signal.) *$8^7 = 8^2 \times 8^3 \times 8^2$.*

- Write that equation. Pencils down when you're finished. √

50

- (Write on the board:) [50:1A]

a. $8^7 = 8^2 \times 8^3 \times 8^2$

- Here's what you should have.

d. Write the complete equation for problem B. Pencils down when you're finished.
(Observe students and give feedback.)

- (Write on the board:) [50:1B]

b. $7^5 = 7^3 \times 7^2$

- Here's what you should have.

e. Write the complete equation for the rest of the items in part 2. Pencils down when you're finished.
(Observe students and give feedback.)

f. Check your work. Read each equation.

- Equation C. (Signal.) $9^9 = 9^4 \times 9^2 \times 9^3$.
- Equation D. (Signal.) $5^4 = 5^2 \times 5^2$.
- Equation E. (Signal.) $10^8 = 10^3 \times 10^3 \times 10^2$.

g. Raise your hand if you got everything right. √

Exercise 2

CIRCUMFERENCE/DIAMETER

— Textbook practice —

a. Find part 3. √

b. You're going to work problems that start with the equation for the circumference of a circle.

- What's the name for 3.14? (Signal.) *Pi.*
- Say the equation for the circumference of a circle. (Signal.) $C = \pi D$.
- For some problems, you'll find the diameter. For others, you'll find the circumference.

c. Touch circle A. √

- What is given, the circumference or the diameter? (Signal.) *Circumference.*
- So you solve for the diameter.
- What do you solve for? (Signal.) *Diameter.*

d. Circle B. What is given, the circumference or the diameter? (Signal.) *Diameter.*

- So what do you solve for? (Signal.) *Circumference.*

e. Circle C. What is given? (Signal.) *Circumference.*

- So what do you solve for? (Signal.) *Diameter.*

f. Circle D. What is given? (Signal.) *Diameter.*

- So what do you solve for? (Signal.) *Circumference.*

g. Circle E. What is given? (Signal.) *Circumference.*

- So what do you solve for? (Signal.) *Diameter.*

h. Work problem A. Use the π key on your calculator. Pencils down when you're finished.
(Observe students and give feedback.)

- (Write on the board:) [50:2A]

a.
$$C = \pi d$$
$$\left(\frac{1}{\pi}\right) 11 = \pi d \left(\frac{1}{\pi}\right)$$
$$\frac{11}{\pi} = d$$
$$\boxed{3.50\ m}$$

- Here's what you should have.
- The circumference is 11 meters. What problem did you work on your calculator? (Signal.) $11 \div \pi$.
- What's the diameter? (Signal.) *3.50 meters.*

i. Work problem B. Pencils down when you're finished.
(Observe students and give feedback.)

- (Write on the board:) [50:2B]

b.
$$C = \pi d$$
$$C = \pi\ (4.5)$$
$$\boxed{14.14\ \text{yd}}$$

- Here's what you should have.
- The diameter is 4.5 yards.
- What problem did you work on your calculator? (Signal.) $\pi \times 4.5$.
- What's the circumference? (Signal.) *14.14 yards.* [*14.13* if 3.14 is used.]

j. Work the rest of the problems in part 3. Pencils down when you're finished.
(Observe students and give feedback.)
k. Check your work.
l. Problem C. The circumference is 2.08 feet.
- What problem did you work on your calculator? (Signal.) *2.08 ÷ π.*
- What's the diameter? (Signal.) *0.66 feet.*

m. Problem D. The diameter is 29 inches.
- What problem did you work on your calculator? (Signal.) *π × 29.*
- What's the circumference? (Signal.) *91.11 inches.* [*91.06* if 3.14 is used.]

n. Problem E. The circumference is 0.8 centimeters.
- What problem did you work on your calculator? (Signal.) *.8 ÷ π.*
- What's the diameter? (Signal.) *0.25 centimeters.*

Exercise 3

RATE EQUATIONS

Reverse Order

— Textbook practice —

a. Find part 4. √
- These are problems you solve with rate equations.
- Last time you wrote the equations so they start with the unit that answers the question.

b. Problem A: A machine produces pencils at the rate of 120 pencils per minute. How long will it take the machine to produce 40 pencils?
- Raise your hand when you know which unit the problem asks about. √
- Which unit? (Signal.) *Minutes.*
- (Write on the board:) [50:3A]

a. $m = m$

- Start with the simple equation **M = M,** and complete the rate equation. Pencils down when you've done that much.
(Observe students and give feedback.)
- Check your work.
- (Write to show:) [50:3B]

a. $m = \left(\frac{m}{p}\right) p$

- Here's what you should have: M = M over P times P.

c. Problem B: There are 3.5 pounds of flour for every pound of sugar. How many pounds of flour are used if 10 pounds of sugar are used?
- Tell me which unit the problem asks about. (Pause. Signal.) *Pounds of flour.*
- Skip 5 lines. Start with the simple equation **PF = PF,** and complete the rate equation. Pencils down when you're finished.
(Observe students and give feedback.)
- Check your work.
- (Write on the board:) [50:3C]

b. $pf = \left(\frac{pf}{ps}\right) ps$

- Here's what you should have: PF = PF over PS times PS.

d. Write letter equations for problems in C and D. Leave space below each equation. Pencils down when you've done that much.
(Observe students and give feedback.)
- Problem C. Read the equation that begins with W. (Signal.) *W = (W/M) M.*
- Problem D. Read the equation that begins with CM. (Signal.) *CM = (CM/Y) Y.*

e. Now work all the problems in part 4. Answer each question with a number and a unit name. Pencils down when you're finished.
(Observe students and give feedback.)
f. Check your work.
- Problem A. How long will it take to produce 40 pencils? (Signal.) *1/3 minute.*
- Problem B. How many pounds of flour are used? (Signal.) *35 pounds.*
- Problem C. How many women work in the factory? (Signal.) *160 women.*

- Problem D. How much will the diameter increase? (Signal.) *18 and 2/3 centimeters.*

Exercise 4

MULTIPLYING INTEGERS

Textbook practice

a. Find part 5. √
- These are multiplication problems with signed numbers.

b. Remember the rules for multiplying 2 values.
- If the signs are the same, what is the sign in the answer? (Signal.) *Plus.*
- If the signs are different, what is the sign in the answer? (Signal.) *Minus.*
- (Repeat step b until firm.)

c. Everybody, read problem A. (Signal.) *– 5 (– 2.3).*
- Are the signs the same or different? (Signal.) *Same.*
- So what's the sign in the answer? (Signal.) *Plus.*

d. Read problem B. (Signal.) *– 3/8 (+ 5).*
- Are the signs the same or different? (Signal.) *Different.*
- So what's the sign in the answer? (Signal.) *Minus.*

e. Copy the problems in part 5 and work them.
- Remember, first figure out the sign in the answer. Then multiply to find the number part of the answer. Pencils down when you're finished.
(Observe students and give feedback.)

f. Check your work.
- Problem A: – 5 (– 2.3).
What's the answer? (Signal.) + *11.5.*
- Problem B: – 3/8 (+ 5).
What's the answer? (Signal.) – *15/8.*
- Problem C: + 6.4 (– 10).
What's the answer? (Signal.) – *64.*
- Problem D: – .4 (+ 2).
What's the answer? (Signal.) – *.8.*
- Problem E: – 7 (– 1).
What's the answer? (Signal.) + *7.*
- Problem F: – 5/7 (– 6).
What's the answer? (Signal.) + 30/7.
- Problem G: + 1 (– 6).
What's the answer? (Signal.) – *6.*
- Problem H: – 2/3 (+ 7).
What's the answer? (Signal.) – *14/3.*

Exercise 5

ALGEBRA

Like Terms on Both Sides

Textbook practice

a. Find part 6. √

b. Problem A: 9W – 3W = 10 + W – 4.
- Remember the steps: First, combine like terms on each side. Then add or subtract to get a letter term on 1 side and a number term on the other side. Then solve for the letter. Pencils down when you've finished problem A.
(Observe students and give feedback.)
- (Write on the board:) [50:5A]

a.

$$\begin{array}{rr} 9w - 3w = & 10 + w - 4 \\ 6w = & 6 + w \\ -w & -w \\ \hline \left(\frac{1}{5}\right) 5w = & 6\left(\frac{1}{5}\right) \end{array}$$

$$\boxed{w = \frac{6}{5}}$$

- The equation with combined like terms is 6W = 6 + W.
- You subtract W from both sides. You get the equation 5W = 6. So W = 6/5.

c. Problem B: 4R – 1 – 13 – R = 3 + 4.
- Combine the like terms. Then solve for R. Pencils down when you're finished.
(Observe students and give feedback.)
- (Write on the board:) [50:5B]

b.

$$\begin{array}{rr} 4r - 1 - 13 - r = & 3 + 4 \\ 3r - 14 = & 7 \\ +14 & +14 \\ \hline \left(\frac{1}{3}\right) 3r = & 21\left(\frac{1}{3}\right) \end{array}$$

$$\boxed{r = 7}$$

- Read the equation with combined like terms. (Signal.) *3R – 14 = 7.*
- What do you do to change both sides? (Signal.) *Add 14.*
  So 3R = 21.
- What does R equal? (Signal.) *7.*

d. Problem C: 10 – 2 = 2 thirds H + 6 + 5 thirds H.

- Combine the like terms. Then figure out what H equals. Pencils down when you're finished.
  (Observe students and give feedback.)
- (Write on the board:) [50:5C]

c.

$$10 - 2 = \frac{2}{3}h + 6 + \frac{5}{3}h$$
$$8 = \frac{7}{3}h + 6$$
$$-6 \qquad -6$$
$$\left(\frac{3}{7}\right)2 = \frac{7}{3}h\left(\frac{3}{7}\right)$$
$$\boxed{\frac{6}{7} = h}$$

- Read the equation with combined like terms. (Signal.) *8 = 7 thirds H + 6.*
- What do you do to change both sides? (Signal.) *Subtract 6.*
- What does H equal? (Signal.) *6/7.*

e. Problem D: 11K – 4K = 15 + 2K – 5.

- Combine the like terms. Then figure out what K equals. Pencils down when you're finished.
  (Observe students and give feedback.)
- (Write on the board:) [50:5D]

d.

$$11k - 4k = 15 + 2k - 5$$
$$7k = 10 + 2k$$
$$-2k \qquad -2k$$
$$\left(\frac{1}{5}\right)5k = 10\left(\frac{1}{5}\right)$$
$$\boxed{k = 2}$$

- Read the equation with combined like terms. (Signal.) *7K = 10 + 2K.*
- What do you do to change both sides? (Signal.) *Subtract 2K.*
- What does K equal? (Signal.) *2.*

f. Problem E: 3G – 7G – 10 + 40 = G.

- Combine the like terms. Then figure out what G equals. Pencils down when you're finished.
  (Observe students and give feedback.)
- (Write on the board:) [50:5E]

e.

$$3g - 7g - 10 + 40 = g$$
$$-4g \qquad +30 = g$$
$$+4g \qquad\qquad +4g$$
$$\left(\frac{1}{5}\right)30 = 5g\left(\frac{1}{5}\right)$$
$$\boxed{6 = g}$$

- Read the equation with combined like terms. (Signal.) *– 4G + 30 = G.*
- What do you do to change both sides? (Signal.) *Add 4G.*
- What does G equal? (Signal.) *6.*

Exercise 6

INDEPENDENT WORK

Assign Independent Work: textbook parts 7–12 and workbook parts 1 and 2.

Lesson 92

Part 1 Rewriting Large Numbers

50,300 = ■ × 10■

- Copy the digits before the final zeros. ***5 03*** × 10■
- Write a decimal point after the first digit. 5.03 × 10■
- Write the exponent for 10. 5.03 × 10^{4}

Part 2 Complete each equation.

a. 752,000 = ■ × 10■

b. 7,131,000 = ■ × 10■

c. 37,000 = ■ × 10■

d. 8040 = ■ × 10■

e. 70,180,000 = ■ × 10■

Independent Work

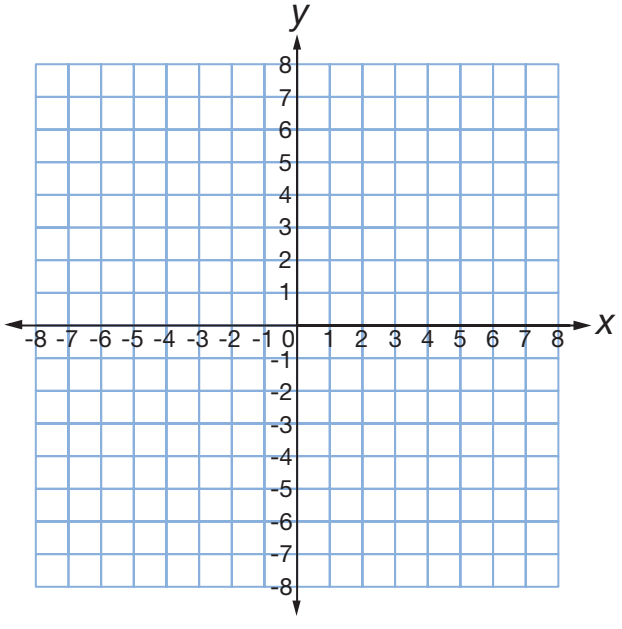
Part 3 Plot the line for each equation.

A $y = -\frac{3}{4}x - 1$

B $y = x - 4$

C $y = -\frac{5}{4}x + 6$

D $y = \frac{4}{3}x$



Lesson 50

Part 1 Exponents for Multiplied Groups

$10 \times 10 \times 10 \times 10 \times 10 \times 10 = 10^6$

$(10 \times 10) \times (10 \times 10 \times 10 \times 10) = 10^6$

$10^2 \times 10^4 = 10^6$

$10 \times 10 \times 10 \times 10 \times 10 \times 10 = 10^6$

$(10 \times 10 \times 10) \times (10 \times 10 \times 10) = 10^6$

$10^3 \times 10^3 = 10^6$

◆ If the base is shown **6 times**, the exponents must **add up to 6**.

Part 2 Copy and complete each boxed equation.

a. $(8 \times 8) \times (8 \times 8 \times 8) \times (8 \times 8)$

$8^7 = \square \times \square \times \square$

b. $(7 \times 7 \times 7) \times (7 \times 7)$

$7^5 = \square \times \square$

c. $(9 \times 9 \times 9 \times 9) \times (9 \times 9) \times (9 \times 9 \times 9)$

$9^9 = \square \times \square \times \square$

d. $(5 \times 5) \times (5 \times 5)$

$5^4 = \square \times \square$

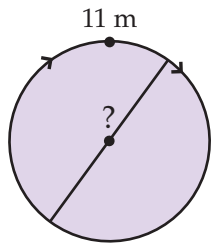
e. $(10 \times 10 \times 10) \times (10 \times 10 \times 10) \times (10 \times 10)$

$10^8 = \square \times \square \times \square$

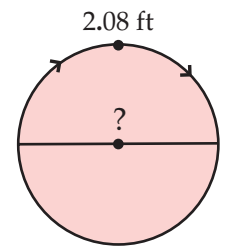
Part 3

Find the circumference or the diameter of each circle.

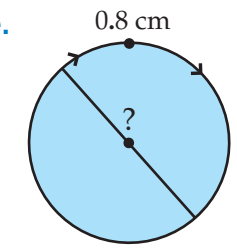
a.



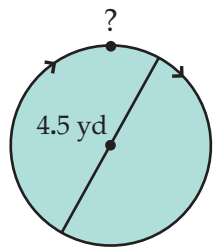
c.



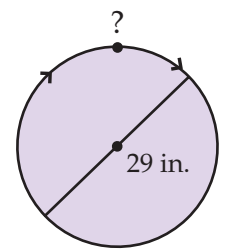
e.



b.



d.



Part 4

For each problem, write the rate equation with letters. Start with the letter that answers the question. Then work the problem.

a. A machine produces pencils at the rate of 120 pencils per minute. How long will it take to produce 40 pencils?

b. There are 3.5 pounds of flour for every pound of sugar. How many pounds of flour are used if 10 pounds of sugar are used?

c. How many women work in a factory that employs 96 men if the ratio of men to women is 3 to 5?

d. A tree trunk grows at a steady rate. If the diameter of the tree trunk increases by 8 centimeters in 3 years, by how much will the diameter increase in 7 years?

Part 5

Copy and work each item. First figure out the sign in the answer. Then multiply.

a. $-5\,(-2.3) =$ ▬

b. $-\frac{3}{8}\,(+5) =$ ▬

c. $+6.4\,(-10) =$ ▬

d. $-.4\,(+2) =$ ▬

e. $-7\,(-1) =$ ▬

f. $-\frac{5}{7}\,(-6) =$ ▬

g. $+1\,(-6) =$ ▬

h. $-\frac{2}{3}\,(+7) =$ ▬

Part 6

Copy each equation. Rewrite each equation with like terms combined. Then solve for the letter.

a. $9w - 3w = 10 + w - 4$

b. $4r - 1 - 13 - r = 3 + 4$

c. $10 - 2 = \frac{2}{3}h + 6 + \frac{5}{3}h$

d. $11k - 4k = 15 + 2k - 5$

e. $3g - 7g - 10 + 40 = g$

Independent Work

Part 7

Work each problem.

a. The jeans cost \$11.30 less than the coat. The jeans cost \$17.55. How much did the coat cost?

b. There were 63 people in the park. 17 were on vacation. How many were not on vacation?

c. Jon's shoes were 1.3 inches shorter than Eric's shoes. Jon's shoes were 10.5 inches long. How long were Eric's shoes?

d. There are 72 boys and 59 girls at the show. How many children are at the show?

e. The number of tables is $\frac{2}{3}$ the number of people. There are 42 tables. How many people are there?

Part 8

Complete each equation to show the base and exponent.

a. $8 \times 8 \times 8 \times 8 \times 8 =$ ▬

b. $10 \times 10 \times 10 =$ ▬

Part 9

Solve each problem.

a. $2t - 30m = 20$ $\boxed{m = \frac{1}{5}}$

b. $14 + m = 2k$ $\boxed{m = 12}$

c. $\frac{1}{8}r + t = 1$ $\boxed{r = -3}$

Part 10 Work each problem.

a. $30 - 5 = -\frac{3}{8}p + p$

b. $2b - 2 + 10b - 1 = 3$

c. Red and yellow birds are nesting in the tree. There are 26 yellow birds. If 48 birds are nesting in the tree, how many red birds are there?

d. A shadow is $\frac{5}{7}$ the height of the hill. The hill is 56 feet high. How long is the shadow?

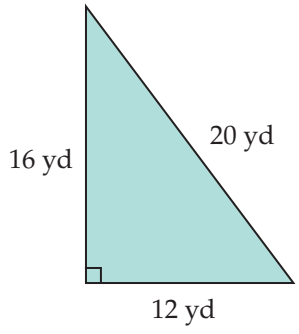
e. The dog is 2.6 months younger than the cat. The cat is 20.8 months old. What's the age of the dog?

f. Furnace M is 66 degrees hotter than furnace P. If furnace P is 588 degrees, what is the temperature inside furnace M?

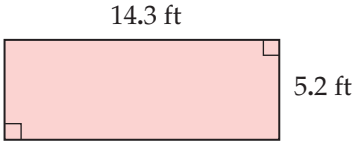
g. 12 of the children are sick. The rest are well. There are 135 children. How many are well?

Part 11 Find the area and perimeter of each figure.

a.



b.



Part 12 Copy and complete each equation. First show the multiplication. Then show the value it equals.

a. $5^4 =$ ____ $=$ ____

b. $7^5 =$ ____ $=$ ____

c. $.5^4 =$ ____ $=$ ____

d. $14^3 =$ ____ $=$ ____