Lesson 104

Exercise 1

EXPONENTS

Combining Terms

— Textbook practice —

a. Open your textbook to lesson 104, part 1. √

- (Teacher reference:)

> ◆ You can't combine terms unless the **base** is the **same.**
> ◆ You can't combine terms unless the **exponents** are the **same.**
>
> $3m^5 + m^5 - 2m^5$ $\quad$ $m^8 + m^3 - 3m + 4m^8 + 3^3$
>
> $\boxed{2m^5}$ $\quad$ $\boxed{5m^8 + m^3 - 3m + 27}$

- For some problems, you don't multiply values with exponents. You combine them through addition or subtraction.

b. The box shows the rules:

- You can't combine terms unless the **base** is the **same.**
- You can't combine terms unless the **exponents** are the **same.**

c. The first expression shows terms that you can combine: $3M^5 + M^5 - 2M^5$.

- We can combine all the Ms to the 5^{th}. We end up with $2M^5$. That's the simplified expression.

d. In the next expression, some terms cannot be combined with others: $M^8 + M^3 - 3M + 4M^8 + 3^3$.

- Remember, both base and exponent must be the same if you combine.
- The first term is M^8. That can be combined with one of the other terms. Everybody, what's that term? (Signal.) $+4M^8$. Yes, plus $4M^8$.
- When you combine $1M^8$ with $+ 4M^8$, what do you get? (Signal.) $5M^8$. Yes, $5M^8$.
- One term is $+M^3$. Can that be combined with any other term? (Signal.) *No.*
- The next term is $-3M$. Can that be combined with any other term? (Signal.) *No.* It can't be combined.
- The last term is $+3^3$. That simplifies to 27.
- What's the simplified expression? (Signal.) $5M^8 + M^3 - 3M + 27$.

— Workbook practice —

a. Open your workbook to lesson 104, part 1. √

- Each expression can be simplified.

b. Expression A. Read it. (Signal.) $7^2 + 3R^4 + 2R^4 + R - 7^2$.

- One of the terms **cannot** be combined with any other term. Raise your hand when you know which term that is. √
- Everybody, which term? (Signal.) $+R$. Yes, plus R. The rest of the terms can be combined.
- The first term is 7^2. That's 49. The last term is -7^2.
- What do you get when you combine $7^2 - 7^2$? (Signal.) *Zero.* Yes, $49 - 49 = 0$.
- What's the second term? (Signal.) $+3R^4$. What can that be combined with? (Signal.) $+2R^4$.
- Write the simplified expression for item A. Pencils down when you're finished. (Observe students and give feedback.)
- Check your work.
- Everybody, what's the simplified expression? (Signal.) $5R^4 + R$.

c. Expression B. Read it. (Signal.) $6M^2 + 3^2 + 5^2 - 5M^2$.

- The first term is $6M^2$. What term can it be combined with? (Signal.) $-5M^2$.
- What do you get when you combine $6M^2 - 5M^2$? (Signal.) M^2.
- What's the second term? (Signal.) $+3^2$.
- What's the third term? (Signal.) $+5^2$.
- You can't combine 3^2 and 5^2, but you can combine $9 + 25$. What's $9 + 25$? (Signal.) *34.*
- Write the simplified expression for item B. Pencils down when you're finshed. (Observe students and give feedback.)
- (Write on the board:) [104:1A]

$$6m^2 + 3^2 + 5^2 - 5m^2$$
$$m^2 + 9 + 25$$
$$\boxed{m^2 + 34}$$

- Check your work.
- Everybody, what's the simplified expression? (Signal.) $M^2 + 34$.

d. Expression C: $P^5 - 3P^4 - 8P^4$.

- Write the simplified expression. √
- Everybody, what's the simplified expression? (Signal.) $P^5 - 11P^4$.

e. Work the rest of the problems in part 1. Pencils down when you're finished. (Observe students and give feedback.)

f. Check your work.

g. Expression D: 3 fifths F^2 – 3 fifths F + 4 fifths F^2.

- What's the simplified expression? (Signal.) *7 fifths F^2 – 3 fifths F.*

h. Expression E: $2R^7 + R^2 - 2R^2 - 8R^7 + R$.

- What's the simplified expression? (Signal.) $-6R^7 - R^2 + R$.

i. Expression F: $-3T + R - R^8 + 5T + 4R^8$.

- What's the simplified expression? (Signal.) $2T + R + 3R^8$.

Exercise 2

STRAIGHT-LINE EQUATION

Solve for *x* or *y*

Workbook practice

a. Find part 2 of your workbook. √

- You're going to plot points and draw a line for an equation.

b. The equation for line A is Y = 2X + 1.

- You're going to plot 2 points on the line, then use the equation to check where the line crosses the Y axis.

c. The first point you'll plot is at X = –2.

- Use equation A to figure out the Y coordinate of that point. Pencils down when you've done that much. √
- (Write on the board.) [104:2A]

A $y = 2x + 1$

$y = 2(-2) + 1$

$y = -4 + 1$

$\boxed{y = -3}$

- Here's what you should have. Y = –3.
- When x = –2, y = –3. Plot the point. Show the X and Y coordinates next to the point. Pencils down when you're finished. (Observe students and give feedback.)
- Check your work.
- (Write on the board:) [104:2B]

(– 2, – 3)

- The point is –2, –3. Raise your hand if you plotted that point. √
- Is your point on line A? (Signal.) *Yes.*

d. Here's information about another point on the line: *Y* = 7.

- Figure out what X equals and plot the point. Show the X and Y coordinates next to the point. Pencils down when you're finished. (Observe students and give feedback.)
- Check your work.
- (Write on the board:) [104:2C]

A $7 = 2x + 1$

$-1 \quad -1$

$\left(\frac{1}{2}\right)6 = 2x\left(\frac{1}{2}\right)$

$\boxed{3 = x}$

- Here's what you should have. X = 3. So the point is 3, 7.
- (Write on the board:) [104:2D]

(3, 7)

e. The equation tells where the line should cross the Y axis. Where should it cross? (Signal.) *+1.*

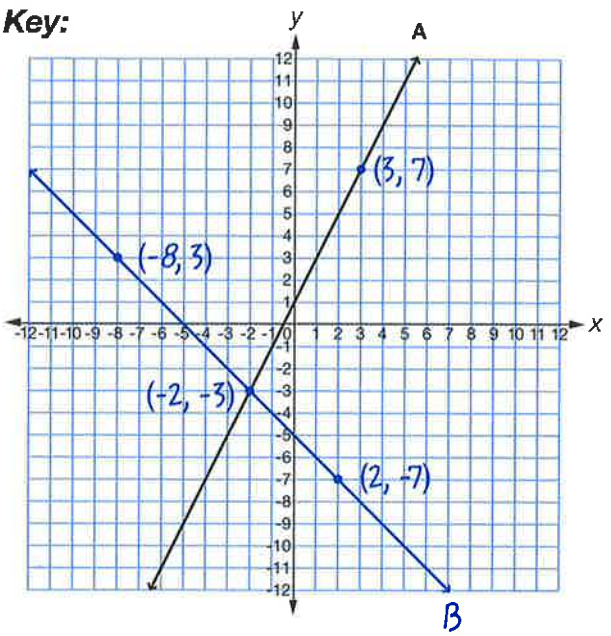
- Look at line A and touch where it crosses the Y axis. √ Where does it cross? (Signal.) *+1.*

f. You need 2 points to draw a line. The next box gives the equation for line B and information for 2 points. Figure out the missing coordinate for each point. Plot the points and label them. Then draw the line. Label it B. Pencils down when you're finished. (Observe students and give feedback.)

- Check your work.
- For line B, the 2 points are 2, –7 and –8, 3.
- The equation tells where the line should cross the Y axis. Where should it cross? (Signal.) –5.
- Check line B to see if it crosses at –5. √

g. Find Part K at the end of lesson 104 in your textbook. That shows what you should have. Check your work. √

Key:



Line B

$y = -x - 5$
$-7 = -x - 5$
$+5 \quad +5$
$-2 = -x$
$\boxed{2 = x}$
$(2, -7)$

$y = -x - 5$
$y = -(-8) - 5$
$y = 8 - 5$
$\boxed{y = 3}$
$(-8, 3)$

h. Remember, the equation for a line tells about all points on the line. If you know one coordinate for a point, you can figure out the other coordinate. The line you draw should cross the *Y* axis where the equation indicates it will cross.

Exercise 3

SCIENTIFIC NOTATION

Negative Exponent

— Workbook practice —

a. Find part 3 of your workbook. √

- (Teacher reference:)

◆ Copy the digits that come after the zeros.	.000064 = ■ × $10^{■}$
◆ Write the decimal point after the first digit.	= 6.4 × $10^{■}$
◆ If the original number is **less than 1,** the exponent is **negative.**	= 6.4 × 10^{-5}

b. You can write very small numbers in scientific notation. The numbers we'll work with are greater than zero, but less than 1.

- The number in the box is .000064. This value is less than 1, so we copy the digits that come **after the zeros.** Those digits are 6 and 4. Then we put the decimal point after the first digit.
  We now have 6.4 times 10 to some power.

c. The rule in the box tells about the exponent of 10: If the original number is **less than 1,** the exponent is **negative.**

- Once more. If the original number is less than 1, what do you know about the exponent? (Signal.) *It's negative.*
- We started with a number that is less than 1, so we just count the number of places from the new decimal point and write the negative exponent.
- Raise your hand when you know how many places we moved the decimal point. √
- How many places? (Signal.) 5.
  So the exponent is **minus** 5.

d. Remember, to write scientific notation for a value that is less than 1, you write a negative exponent, not a positive one.

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— Workbook practice —

a. Find part 4. √

- These are numbers that are less than 1. You'll write the scientific notation for each number.

b. Number A is 0.00852.

- Everybody, say the digits you'll copy. (Signal.) *8, 5, 2.*
- You'll put the decimal point after which digit? (Signal.) *8.*
- Write 8.52. Then count the number of places from the new decimal point to the original decimal point and complete the notation. Remember, the exponent is negative. Pencils down when you're finished.
  (Observe students and give feedback.)
- (Write on the board:) [104:3A]

a. 8.52×10^{-3}

- Here's what you should have: 8.52 times 10 to the minus 3rd.

c. Write the scientific notation for the rest of the numbers in part 4. Pencils down when you're finished.
(Observe students and give feedback.)

d. Check your work.
For each problem, I'll say the original number. You'll say the scientific notation.

- Number B: .000049.
  What's the scientific notation? (Signal.) *4.9 times 10 to the minus 5th.*
- Number C: .0000003.
  What's the scientific notation?
  (Signal.) *3.0 times 10 to the minus 7th.* Yes, 3 point zero $\times$ 10 ^{7}.
- Number D: .0001008.
  What's the scientific notation?
  (Signal.) *1.008 times 10 to the minus 4th.*
- Number E: 0.0706.
  What's the scientific notation?
  (Signal.) *7.06 times 10 to the minus 2nd.*

Exercise 4

PROBABILITY

Independent Events

— Textbook practice —

a. Find textbook part 2. √

- These are like the probability problems you worked last time. They have trials that involve doing more than 1 thing.

b. Problem A: In a bathroom, 7/9 of the toys are ducks. 1/3 of the towels are green. If you were blindfolded and reached for a toy, then a towel, what's the probability that you would pick out a toy duck and a towel that is green?

- Work the problem. Pencils down when you're finished.
  (Observe students and give feedback.)
- Check your work.
- Everybody, say the multiplication problem and the answer. (Signal.) *7/9 × 1/3 = 7/27.*

c. Problem B: At the rummage sale, there are 2 drawings. One is a door prize. The probability of winning the door prize is 1/50. The chance of winning the other prize is 3/100.

- Work the problem and figure out the probability of a person winning both the door prize and the other prize. Pencils down when you're finished.
  (Observe students and give feedback.)
- Check your work.
- Say the multiplication problem and the answer. (Signal.) *1/50 × 3/100 = 3/5000.* So you'd expect a person to win both both prizes only 3 times in 5000 trials.

d. Problem C: There is 1 joker in a pack of 20 cards, and 3 jokers in another pack of 35 cards. What's the probability of pulling a joker from both packs on the same trial?

- Work the problem. Pencils down when you're finished.
  (Observe students and give feedback.)
- Check your work.
- Say the multiplication problem and the answer. (Signal.) *1/20 × 3/35 = 3/700.*

e. Problem D: The probability of rain tomorrow is 2/9. The probability of a horn sounding tomorrow is 1/3. What's the probability of both events happening?
- Work the problem. Pencils down when you're finished.
(Observe students and give feedback.)
- Check your work.
- Say the multiplication problem and the answer. (Signal.) *2/9 × 1/3 = 2/27.*
It's not very likely that both events would happen.

Exercise 5

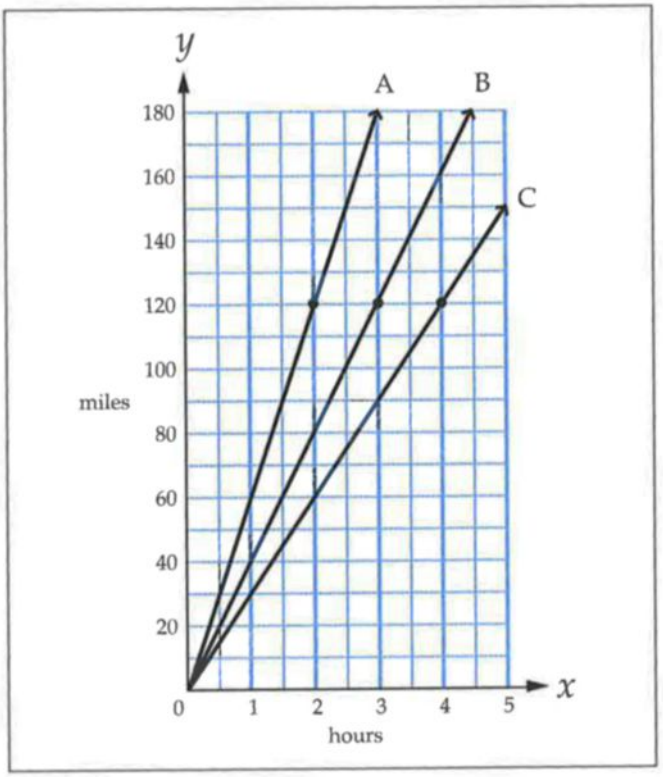
GRAPHING RATE

Questions That Compare

— Textbook practice —

a. Find part 3. √

b. You learned that you can compare distances between things that have different rates.
- You can also compare the time between things that have different rates. You use the same distance and find the difference in time.
- (Teacher reference:)



c. This graph is the one you worked with last time.
- Remember, the steeper the slope, the faster the rate.
- Which car has the fastest rate? (Signal.) *Car A.*
- Which car has the slowest rate? (Signal.) *Car C.*

d. The points show the cars at the same distance.
- What distance is that? (Signal.) *120 miles.* Yes, 120 miles.
- It took each car a different amount of time to travel 120 miles.

e. How long did it take car A to go 120 miles? (Signal.) *2 hours.*
- How long did it take car B to go 120 miles? (Signal.) *3 hours.*
- So what's the difference in time? (Signal.) *1 hour.* Yes, 3 – 2 = 1 hour.

f. How long did it take car C to go 120 miles? (Signal.) *4 hours.*
- So how much longer did it take car C than car A? (Signal.) *2 hours.*
Yes, 4 – 2 = 2 hours.

g. Remember, start with the Y axis and find the point on each line that has the same Y value. The difference in the X values shows the difference in the time it took.

h. Problem A: What's the difference in the time it takes car A and car C to go 90 miles?
- Find 90 miles on the Y axis and figure out the difference in time. Raise your hand when you know the answer. √
- Everybody, what's the difference in time? (Signal.) *1 and 1/2 hours.*
- Write the answer for A. √

i. Problem B: What's the difference in distance between car A and car B after 3 hours?
- This problem asks about the difference in distance after 3 hours. Find **3 hours** on the X axis and figure out the difference in distance. Pencils down when you've worked the problem. √
- Everybody, read the subtraction problem. (Signal.) *180 – 120.*

- What's the difference in distance? (Signal.) *60 miles.*

j. Problem C: How much longer does it take car B than car A to go 60 miles?

- Pencils down when you've written the answer. √
- Everybody, how much longer does it take car B to go 60 miles? (Signal.) *1/2 hour.*

— Textbook practice —

a. Find part 4. √

- This graph shows the average rate of a truck and an RV.

b. Problem A: After 3 hours, how much farther does the truck go than the RV?

- Pencils down when you've worked the problem. √
- Read the subtraction problem you worked. (Signal.) *75 – 30.*
- How much farther did the truck go? (Signal.) *45 miles.*

c. Problem B: How much more time does it take the RV to go 75 miles than the truck?

- Pencils down when you've worked the problem. √
- What subtraction problem did you work? (Call on a student. Idea: *7 and 1/2 – 3.*)
- Everybody, how much more time does it take the RV? (Signal.) *4 and 1/2 hours.*

d. Problem C: How far apart are the 2 vehicles after 4 hours?

- Pencils down when you've worked the problem. √
- Read the subtraction problem you worked. (Signal.) *100 – 40.*
- How far apart are they? (Signal.) *60 miles.*

Exercise 6

ALGEBRA TRANSLATION

Ask or Tell a Fraction or Percent

— Textbook practice —

a. Find part 5. √

- Some of these items **tell** about a fraction or a percent.
- Some of them **ask** about a fraction or a percent.

b. You're going to write the equation for each sentence. Remember, write F for a fraction you don't know, and *P* over 100 for a percent you don't know. Write an equation for each sentence. Pencils down when you're finished.
(Observe students and give feedback.)

c. (Assign 5 students to write equations for items A–E on the board. Students are to work simultaneously.)

Key for board:

a. $f(b) = nt$

b. $\frac{30}{100}\, b = t$

c. $\frac{3}{5}\, b = c$

d. $\frac{P}{100}(d) = r$

e. $\frac{10}{100}\, g = nw$

d. Check your work.

- Item A: What fraction of the balls are not tennis balls?
Read the equation. (Signal.) *F (B) = NT.*
- Item B: 30% of the bulbs were tulips.
Read the equation. (Signal.) *30/100 B = T.*
- Item C: 3/5 of the boys wore coats.
Read the equation. (Signal.) *3/5 B = C.*
- Item D: What percent of the days were rainy? Read the equation. (Signal.) *P/100 (D) = R.*
- Item E: 10% of the gifts were not wrapped. Read the equation. (Signal.) *10/100 G = NW.*

Exercise 7

INDEPENDENT WORK

Assign Independent Work: textbook parts 6–16 and workbook part 5.