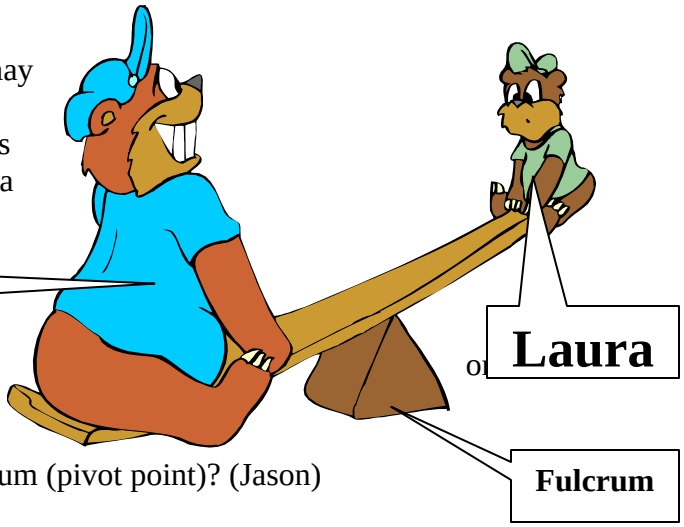
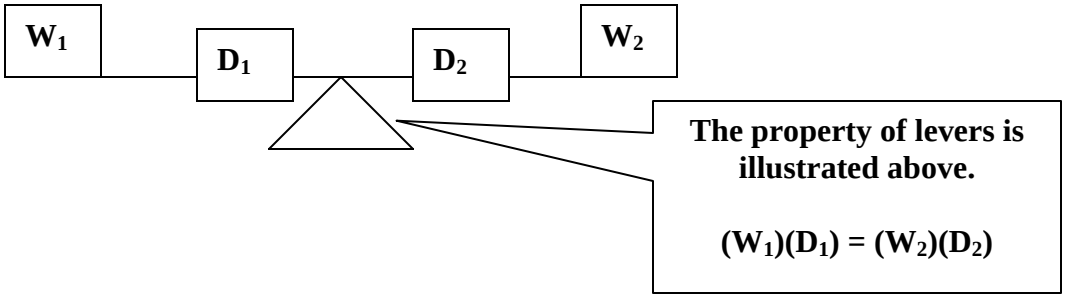
BALANCING ACT OF THE FULCRUM EXAMPLES

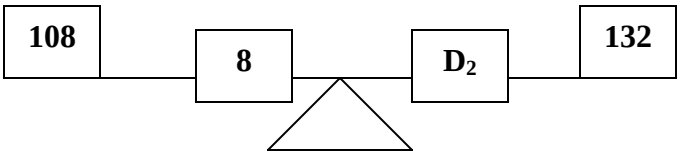
If you have observed people on a seesaw, you may have noticed that the heavier person must sit closer to the fulcrum to balance a seesaw. This is an example of an inverse variation. A seesaw is a type of lever.



Discussion Question 1 – Laura and Jason are o seesaw. They want the seesaw to balance. Jason weighs 132 pounds and Laura weighs 108 pounds. Which should sit closer to the fulcrum (pivot point)? (Jason)

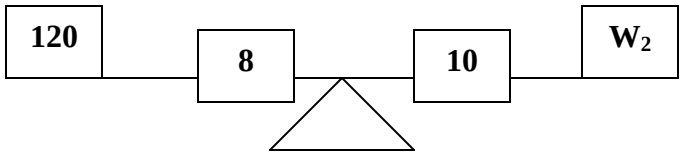


Example # 1 – The fulcrum of a 16-ft seesaw is placed in the middle, Jason, who weighs 108 pounds is seated 8 feet from the fulcrum. How far from the fulcrum should Laura sit if she weighs 132 pounds?



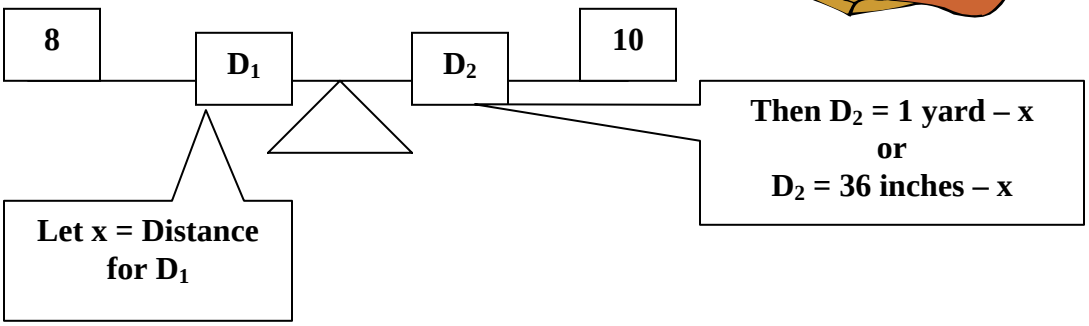
Use the "property of levers" $(W_1)(D_1) = (W_2)(D_2)$.
Let $W_1 = 108$, $D_1 = 8$, $W_2 = 132$. Solve for D_2
$108(8) = 132(D_2)$
$864 = 132D_2$
$6\ 6/11 = D_2$

Example # 2 – A 120-pound weight is located 8 feet from the fulcrum of a lever. How much weight at a distance of 10 feet on the opposite side of the fulcrum would balance it?



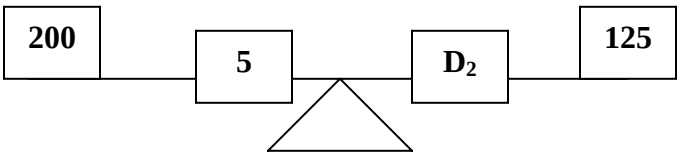
Use the "**property of levers**" $(W_1)(D_1) = (W_2)(D_2)$.
Let $W_1 = 120$, $D_1 = 8$, $D_2 = 10$, solve for W_2.
$120(8) = 10(W_2)$
$960 = 10(W_2)$
$96 = W_2$

Example # 3 – An 8-ounce weight is placed at one end of a yardstick. A 10-ounce weight is placed at the other end. Where should the fulcrum be placed to have the yardstick balanced?



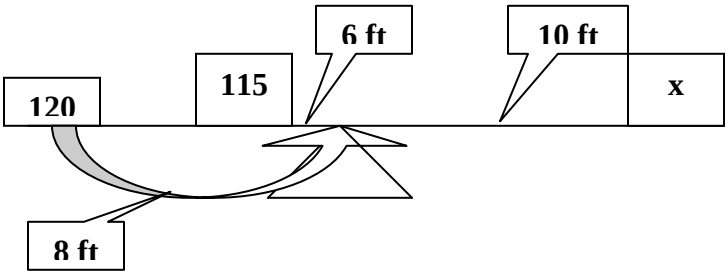
Use the "**property of levers**" $(W_1)(D_1) = (W_2)(D_2)$.
$8(x) = 10(36 - x)$
$8x = 360 - 10x$
$8x + 10x = 360 - 10x + 10x$
$18x = 360$
x = 20 inches from the 8-ounce weight or 16 inches from the 10-ounce weight.

Example # 4 – A 200-pound weight is located 5 feet from the fulcrum. How far from the fulcrum should 125 pounds be placed to balance the lever?



Use the "**property of levers**" $(W_1)(D_1) = (W_2)(D_2)$.
$200(5) = D_2(125)$
$1000 = 125D_2$
$1000/125 = D_2$
$8 \text{ ft} = D_2$

Example # 5 – Patti and Cathy are seated on the same side of a seesaw. Patti is 6 feet from the fulcrum and weighs 115 pounds. Cathy is 8 feet from the fulcrum and weighs 120 pounds. Jud is seated on the other side of the seesaw, 10 feet from the fulcrum. If the seesaw is balanced, how much does Jud weigh?



Use the "**property of levers**" $(W_1)(D_1) + (W_2)(D_2) = (W_3)(D_3)$

$120(8) + 115(6) = 10(x)$
$960 + 690 = 10x$
$1650 = 10x$
$165 = x$
Thus, Jud weighs 165 pounds.

Name:_____
Date:_____
Class:_____

BALANCING ACT OF THE FULCRUM WORKSHEET

For each of the following, suppose the two people are on a seesaw. For the seesaw to balance, which person must sit closer to the fulcrum?

1. George, 168 pounds or Sally, 220 pounds?
2. Sam, 114 pounds or Shane, 97 pounds?
3. Jake, 49 pounds or Lucy, 49 pounds?
4. Stacy, 52 kg or Harriet, 55 kg?
5. Jud, 50 kg or Beth, 58 kg?
6. John, 72 pounds or Joe, 68 pounds?

For each problem draw a fulcrum and label. Then use the 4-step approach to problem solving:

a. Explore “Define a variable.”
b. Plan “Write an equation.”
c. Solve “Solve the equation and answer the problem.” (Be sure to include units.)
d. Examine “Check to see if the answer makes sense.”

7. Mary Jo weighs 120 pounds and Dan weighs 160 pounds. They are seated at opposite ends of a seesaw. Dan and Mary Jo are 14 feet apart, and the seesaw is balanced. How far is Mary Jo from the fulcrum?

8. Grace, who weighs 150 pounds, is seated 8 feet from the fulcrum of a seesaw. Marvin is seated 10 feet from the fulcrum. If the seesaw is balanced, how much does Marvin weigh?

9. A lever has a 140-pound weight on one end and a 160-poound weight on the other end. The lever is balanced, and the 140-pound weight is exactly one foot farther from the fulcrum than the 160-pound weight. How far from the fulcrum is the 160-pound weight?

10. Mason, who weighs 108 pounds, is seated 5 feet from the fulcrum of a seesaw. Benita is seated on the same side of the seesaw, two feet farther from the fulcrum than Mason. Benita weighs 96 pounds. The seesaw is balanced when Sue, who weighs 101 pounds, sits on the other side. How far is Sue from the fulcrum?

BALANCING ACT OF THE WORKSHEET KEY

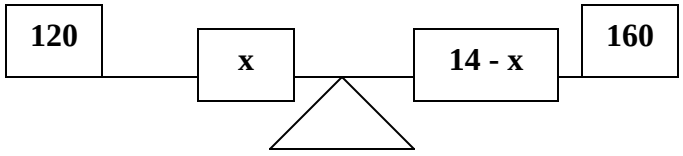
For each of the following, suppose the two people are on a seesaw. For the seesaw to balance, which person must sit closer to the fulcrum?

1. George, 168 pounds or Sally, 220 pounds? - Sally
2. Sam, 114 pounds or Shane, 97 pounds? - Sam
3. Jake, 49 pounds or Lucy, 49 pounds? – Same distance
4. Stacy, 52 kg or Harriet, 55 kg? - Harriet
5. Jud, 50 kg or Beth, 58 kg? - Beth
6. John, 72 pounds or Joe, 68 pounds? - John

For each problem **"<u>draw a fulcrum and label.</u>"** Then use the 4-step approach to problem solving:

a. Explore "Define a variable"
b. Plan "Write an equation"
c. Solve "Solve the equation and answer the problem"
d. Examine "Check to see if the answer makes sense"

7. Mary Jo weighs 120 pounds and Dan weighs 160 pounds. They are seated at opposite ends of a seesaw. Dan and Mary Jo are 14 feet apart, and the seesaw is balanced. How far is Mary Jo from the fulcrum?

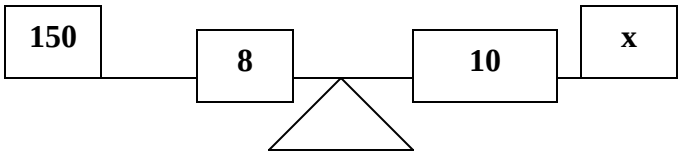


Use the "**property of levers**" $(W_1)(D_1) = (W_2)(D_2)$.

$120(x) = (14 - x)(160)$
$120x = 2240 - 160x$
$120x + 160x = 2240 - 160x + 160x$
$280x = 2240$
$280x \div 280 = 2560 \div 280$
$x = 8$ feet

Is $120(8) = (14 - 8)(160)$?
Is $960 = 960$
(YES)

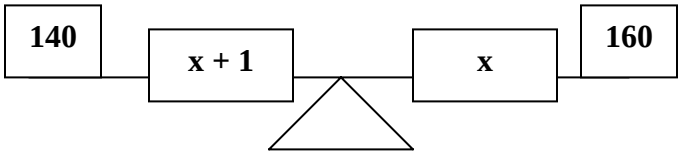
8. Grace, who weighs 150 pounds, is seated 8 feet from the fulcrum of a seesaw. Marvin is seated 10 feet from the fulcrum. If the seesaw is balanced, how much does Marvin weigh?



Use the "**property of levers**" $(W_1)(D_1) = (W_2)(D_2)$.
$150(8) = 10(x)$
$1200 = 10x$
$1200 \div 10 = 10x \div 10$
$120 = x$
Marvin weighs 120 pounds

Is 150(8) = (10)(120)?
Is 1200 = 1200
(YES)

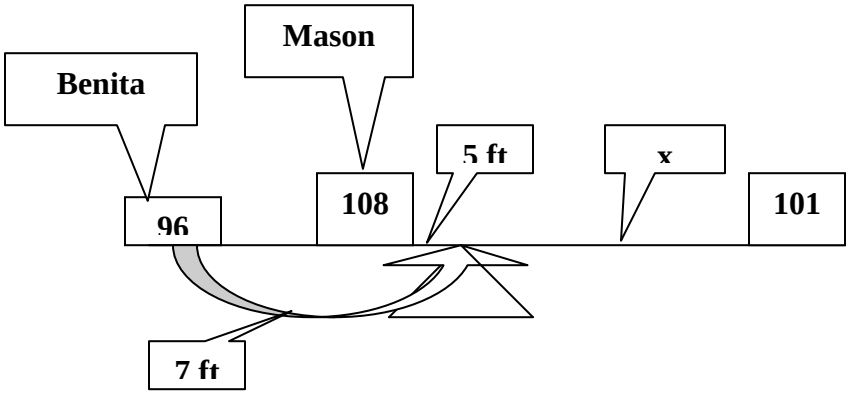
9. A lever has a 140-pound weight on one end and a 160-poound weight on the other end. The lever is balanced, and the 140-pound weight is exactly one foot farther from the fulcrum than the 160-pound weight. How far from the fulcrum is the 160-pound weight?



Use the "**property of levers**" $(W_1)(D_1) = (W_2)(D_2)$.
$140(x + 1) = (x)(160)$
$140x + 140 = 160x$
$140x – 140x + 140 = 160x – 140x$
$140 = 20x$
$140 \div 20 = 20x \div 20$
7 feet = x

Is 140(7 + 1) = 7(160)
Is 1120 = 1120
(YES)

10. Mason, who weighs 108 pounds, is seated 5 feet from the fulcrum of a seesaw. Benita is seated on the same side of the seesaw, two feet farther from the fulcrum than Mason. Benita weighs 96 pounds. The seesaw is balanced when Sue, who weighs 101 pounds, sits on the other side. How far is Sue from the fulcrum?



Use the "**property of levers**" $(W_1)(D_1) + (W_2)(D_2) = (W_3)(D_3)$

$96(7) + 108(5) = x(101)$

$672 + 540 = 101x$

$1212 = 101x$

$1212 \div 101 = 101x \div 101$

12 feet = x

Is 96(7) + 108(5) = 12(101)
Is 672 + 540 = 1212
Is 1212 = 121
(YES)

Student Name: _____

Date: _____

BALANCING ACT OF THE FULCRUM CHECKLIST

1. On questions (1 – 6), did the student estimate correctly who should sit closer to the fulcrum?

    a. All six (30 points)
    b. Five of the six (25 points)
    c. Four of the six (20 points)
    d. Three of the six (15 points)
    e. Two of the six (10 points)
    f. One of the six (5 points)

2. On questions (7 – 10), did the student use the 4-step approach to problem solving?

    a. All four (30 points)
    b. Three of the four (25 points)
    c. Two of the four (20 points)
    d. One of the four (15 points)

3. On questions (7 – 10), did the student solve the problem correctly?

    a. All four (30 points)
    b. Three of the four (25 points)
    c. Two of the four (20 points)
    d. One of the four (15 points)

Total Number of Points _____

A	81 points and above
B	72 points and above
C	63 points and above
D	54 points and above
F	53 points and below