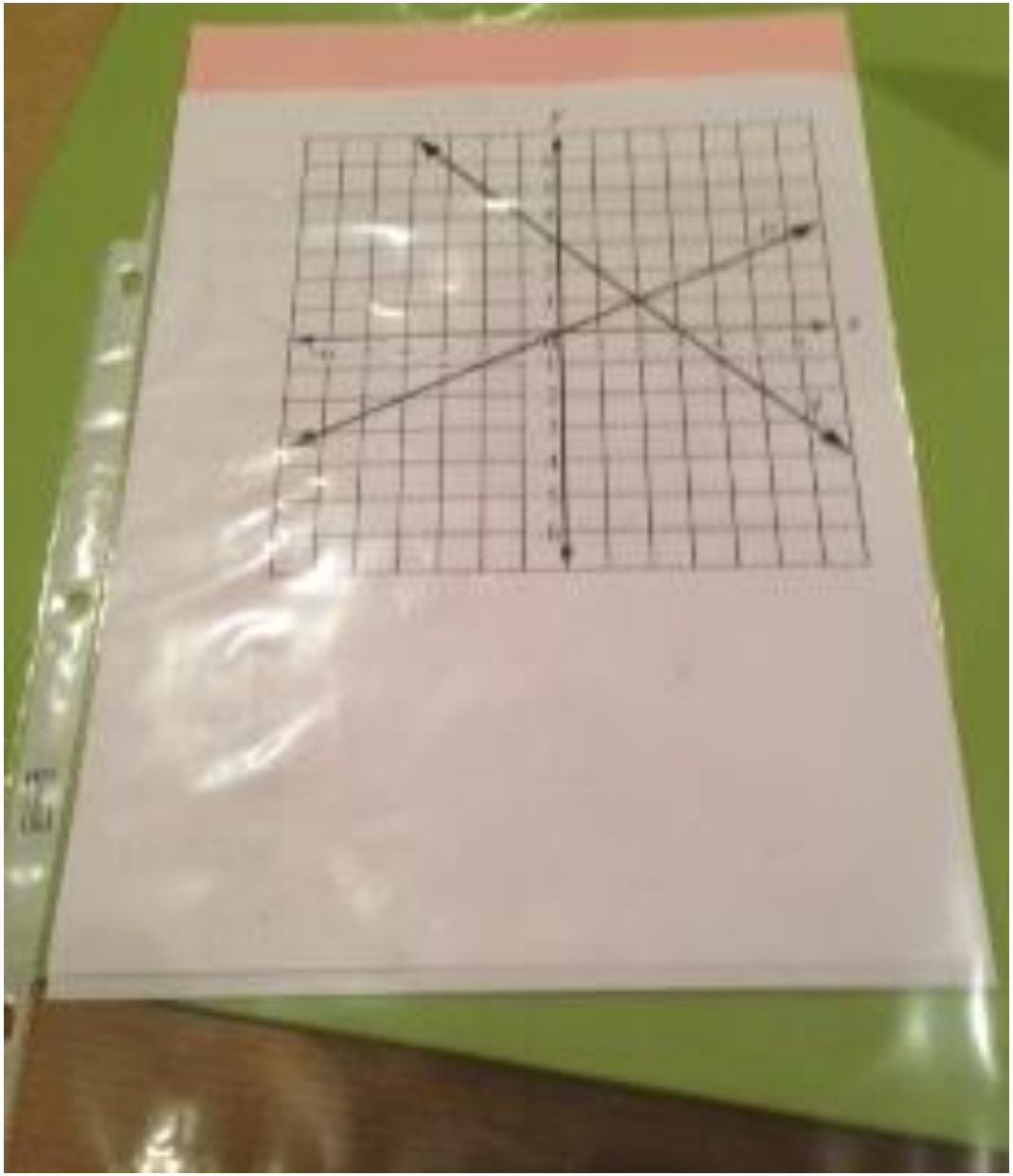
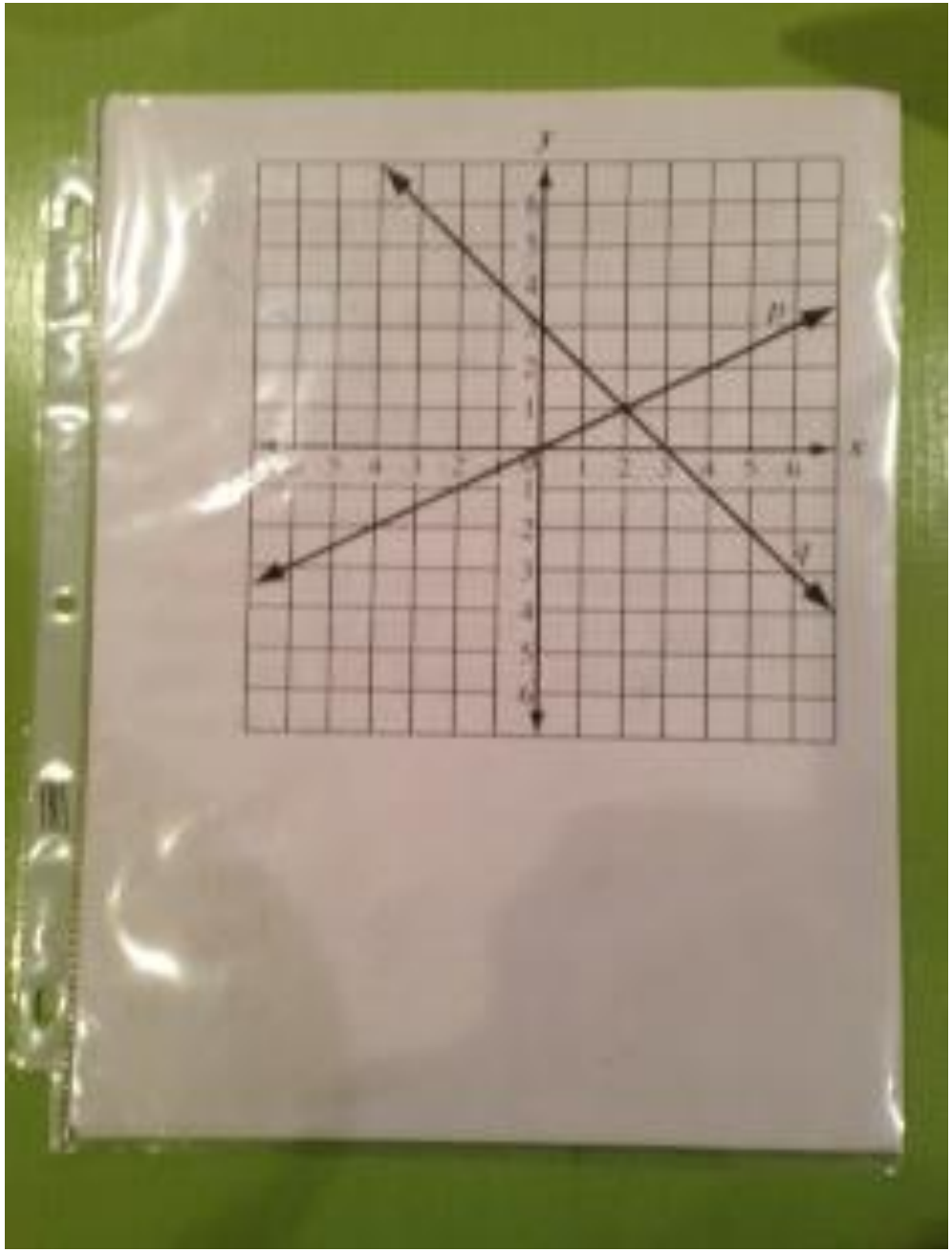
The One Penny Whiteboard

Ongoing, “in the moment” assessments may be the most powerful tool teachers have for improving student performance. For students to get better at anything, they need lots of quick rigorous practice, spaced over time, with immediate feedback. The One Penny Whiteboards can do just that.

To add the One Penny White Board to your teaching repertoire, just purchase some sheet protectors and white board markers (see the following slides). Next, find something that will erase the whiteboards (tissues, napkins, socks, or felt). Finally, fill each sheet protector (or have students do it) with 1 or 2 sheets of card stock paper to give it more weight and stability.





Expo Low Odor Chisel Tip Dry Erase Markers, 12 Black Markers (80001) by Expo

~~$21.99~~ **$8.39** Prime

In Stock

More Buying Choices
$8.29 new (55 offers)
$8.58 used (1 offer)

(120)

FREE Shipping on orders over $35

Product Features
Pack of 12 *Markers*

Office Products: See all 63 items

Expo Low Odor Fine Tip Dry Erase Markers, 12 Black Markers (86001) by Expo

~~$16.99~~ **$7.61** Prime

Order in the next **22 hours** and get it by **Thursday, Jan 9**.

More Buying Choices
$7.61 new (38 offers)

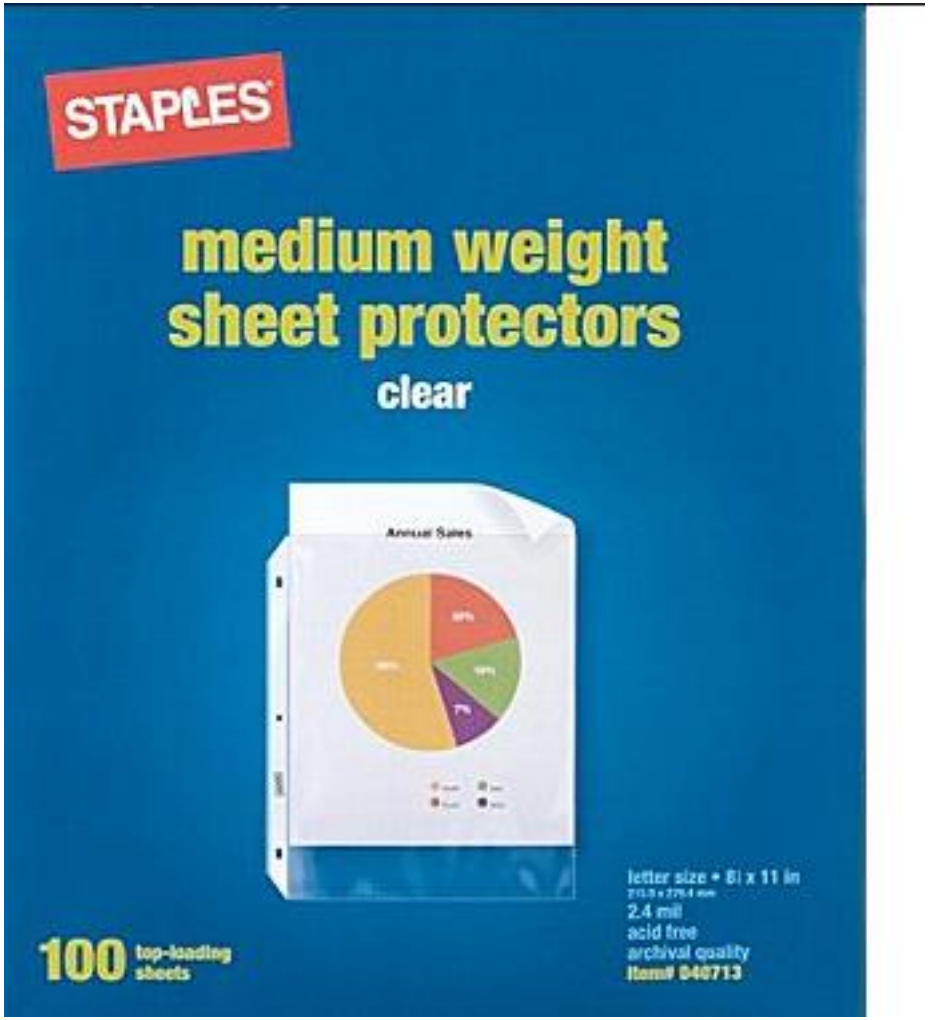
(54)

FREE Shipping on orders over $35

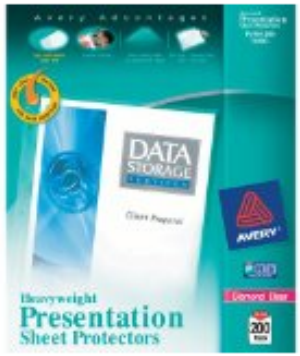
Product Features
... Low odor *dry erase marker* with great erasability. Nontoxic ink works ...

Office Products: See all 63 items

On Amazon, markers can be found as low as $0.63 each. (That's not even a bulk discount. Consider "low odor" for students who are sensitive to smells.)



I like the heavy-weight model.



Avery Diamond Clear Heavyweight Sheet Protector 200 Pack (74400) by Avery (Jan 21, 2009)

~~$42.99~~ **$18.99** Prime

Order in the next **20 hours** and get it by **Thursday, Jan 9.**

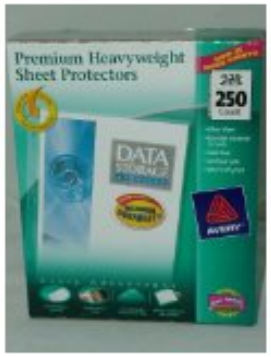
More Buying Choices
$16.95 new (37 offers)
$17.00 used (1 offer)

(138)

FREE Shipping on orders over $35

Product Features
Includes 200 *sheet protectors*

Office Products: See all 10,978 items



Avery Top Loading Clear Sheet Protectors, Heavyweight, 250 per Box #76006 by Avery

$21.39 Prime

In Stock

More Buying Choices
$17.71 new (16 offers)
$19.16 used (5 offers)

(47)

FREE Shipping on orders over $35

Product Features
Includes 250 *sheet protectors*

Office Products: See all 10,978 items

On Amazon, Avery protectors can be found as low as $0.09 each.

One Penny Whiteboards and The Templates

The One Penny Whiteboards have advantages over traditional whiteboards because they are light, portable, and able to contain a template. (A template is any paper you slide into the sheet protector). Students find templates helpful because they can work on top of the image (number line, graph paper, hundreds chart…) without having to draw it first. For more templates go to www.collinsed.com/billatwood.htm)

Using the One Penny Whiteboards

There are many ways to use these whiteboards. One way is to pose a question, and then let the students work on them for a bit. Then say, "Check your neighbor's answer, fix if necessary, then hold them up." This gets more students involved and allows for more eyes and feedback on the work.

Using the One Penny Whiteboards
Group Game

One way to use the whiteboards is to pose a challenge and make the session into a kind of game with a scoring system. For example, make each question worth 5 possible points.

Everyone gets it right: 5 points
Most everyone (4 fifths): 4 points
More than half (3 fifths): 3 points
Slightly less than half (2 fifths): 2 points
A small number of students (1 fifth): 1 point

Challenge your class to get to 50 points. Remember students should check their neighbor's work before holding up the whiteboard. This way it is cooperative and competitive.

Using the One Penny Whiteboards Without Partners

Another way to use the whiteboards is for students to work on their own. Then, when students hold up the boards, use a class list to keep track who is struggling. After you can follow up later with individualized instruction.

Keep the Pace Brisk and Celebrate Mistakes

However you decide to use the One Penny Whiteboards, keep it moving! You don't have to wait for everyone to complete a perfect answer. Have students work with the problem a bit, check it, and even if a couple kids are still working, give another question. They will work more quickly with a second chance. Anytime there is an issue, clarify and then pose another similar problem.

Celebrate mistakes. Without them, there is no learning. Hold up mistakes and say, "Now, here is an excellent mistake–one we can all learn from. What mistake is this? Why is this tricky? How do we fix it?"

The Questions Are Everything!

The questions you ask are critical. Without rigorous questions, there will be no rigorous practice or thinking. On the other hand, if the questions are too hard, students will be frustrated. They key is to jump back and forth from less rigor to more rigor. Also, use the models written by students who have the correct answer to show others. Once one person gets it, they all can get it.

Questions

When posing questions for the One Penny Whiteboard, keep several things in mind:

1. Mix low and high level questions
2. Mix the strands (it may be possible to ask about fractions, geometry, and measurement on the same template)
3. Mix in math and academic vocabulary (*Calculate* the **area**… use an **expression**… *determine* the *approximate* **difference**)
4. Mix verbal and written questions (project the written questions onto a screen to build reading skills)
5. Consider how much ink the answer will require and how much time it will take a student to answer (You don't want to waste valuable ink and you want to keep things moving.)
6. To increase rigor you can: work backwards, use variables, ask "what if", make multi-step problems, analyze a mistake, ask for another method, or ask students to briefly show why it works

Examples

What follows are some sample questions that address some concepts and skills indentified beginning in Grade 6 SP 4-5. There are many other concepts within this strand. This is only a sample.

Each of these questions can be solved on the One Penny Whiteboard.

To mix things up, you can have students "chant" out answers in choral fashion for some rapid fire questions. You can also have students hold up fingers to show which answer is correct.

Remember, to ask verbal follow-ups to individual students: Why does that rule work? How do you know you are right? Is there another way? Why is this wrong?

Statistics and Probability 6.SP

Develop understanding of statistical variability.

1. Recognize a statistical question as one that anticipates variability in the data related to the question and accounts for it in the answers. *For example, "How old am I?" is not a statistical question, but "How old are the students in my school?" is a statistical question because one anticipates variability in students' ages.*
2. Understand that a set of data collected to answer a statistical question has a distribution which can be described by its center, spread, and overall shape.
3. Recognize that a measure of center for a numerical data set summarizes all of its values with a single number, while a measure of variation describes how its values vary with a single number.

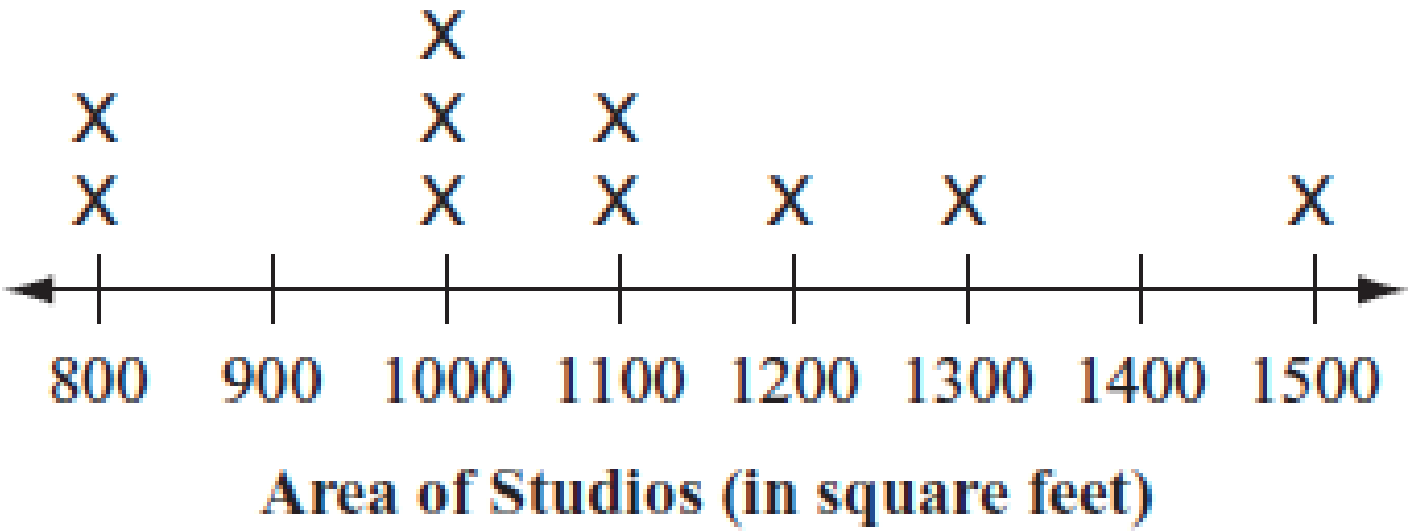
Summarize and describe distributions.

4. Display numerical data in plots on a number line, including dot plots, histograms, and box plots. MA.4.a. Read and interpret circle graphs.

5. Summarize numerical data sets in relation to their context, such as by:
   a. Reporting the number of observations.
   b. Describing the nature of the attribute under investigation, including how it was measured and its units of measurement.
   c. Giving quantitative measures of center (median and/or mean) and variability (interquartile range and/or mean absolute deviation), as well as describing any overall pattern and any striking deviations from the overall pattern with reference to the context in which the data were gathered.
   d. Relating the choice of measures of center and variability to the shape of the data distribution and the context in which the data were gathered.

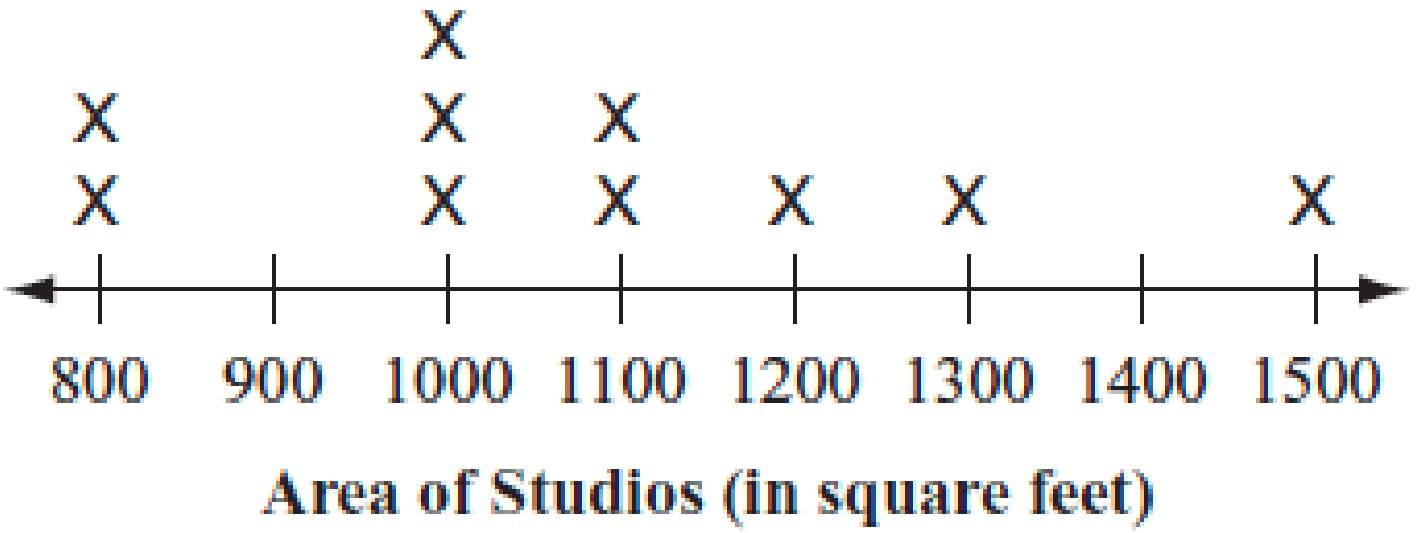
Teachers: Print the next slide and then have students insert it into their whiteboards.

6 The line plot below shows the area, in square feet, of each studio in an art center.



Type One Writing:
On a sheet of paper, write down 3 or more possible questions that might be asked about the graphic below.

6 The line plot below shows the area, in square feet, of each studio in an art center.



Type 1

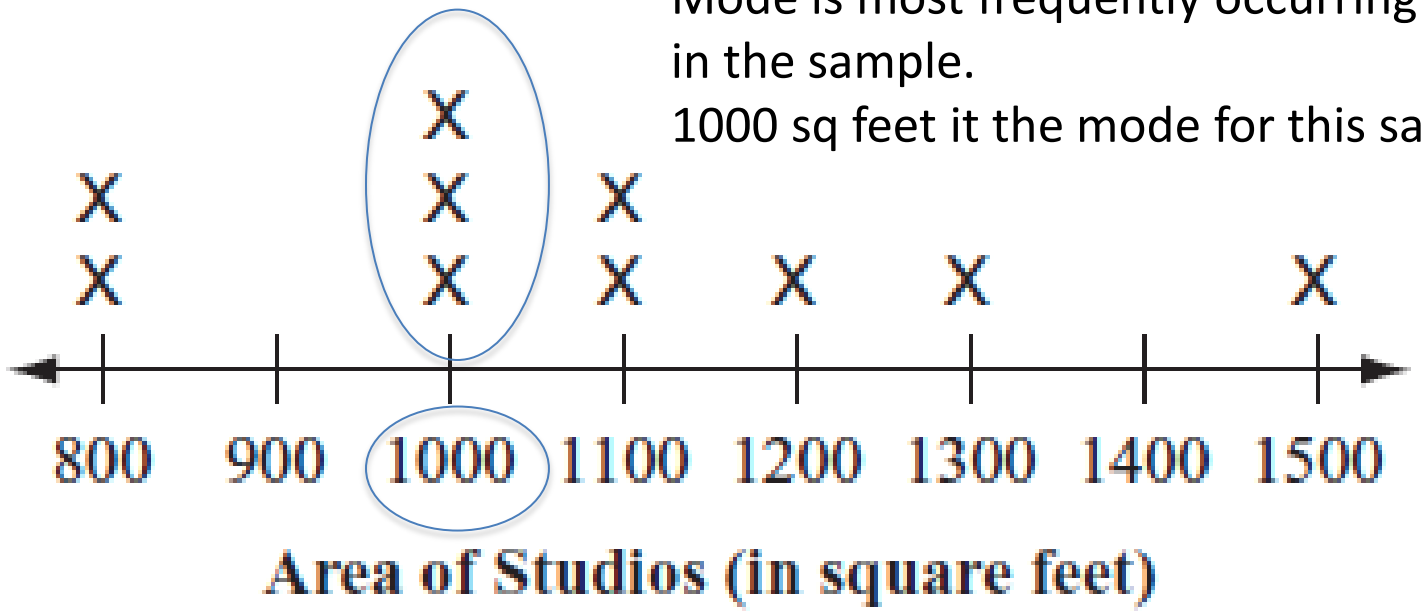
1. What is the line plot showing?
2. How many studios in sample?
3. What method did they use to get this data? Is it random?
4. What is the range? (Spread, variation)
5. What is the mode?
6. What is the median? (measure of center)
7. What is the mean? (measure of center)
8. What studio sizes would you need to add to raise the mean to 1200 sq. feet?
9. How would the median be affected by adding a 1400 square foot studio to the data?
10. Is there an outlier? What is the shape of the data?
11. What fraction is above 1200 sq. feet?
12. What is the inter-quartile range? Mean absolute deviation?
13. Make a bar graph, stem and leaf graph, histogram, circle graph, or box plot from this data.

Solve the following problems on your whiteboard then check with your partner. On my signal, hold up your whiteboards. Then I will show the answer and the reason why…

Circle the mode. What does the term mode mean?

Raise your hand: What does the mode mean in this situation? If you were an architect how might you use this data?

6 The line plot below shows the area, in square feet, of each studio in an art center.



Mode is most frequently occurring number in the sample.
1000 sq feet it the mode for this sample.

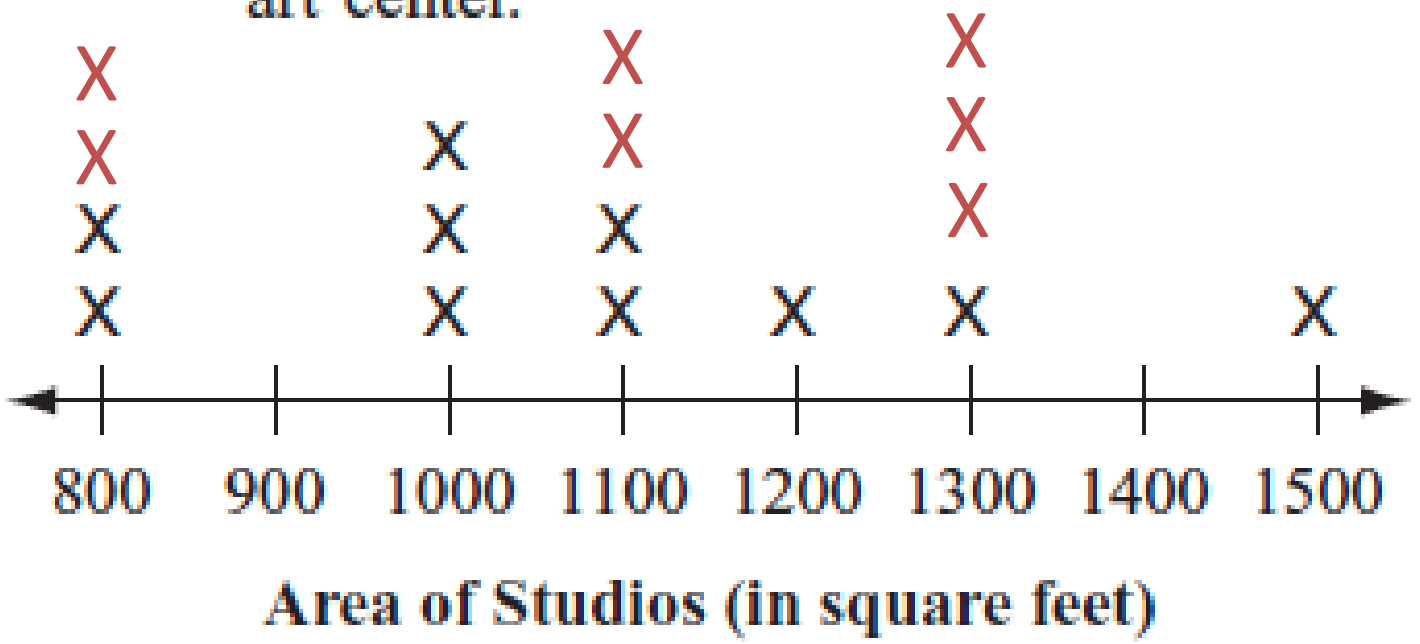
The mode means the most frequent size of the studios. In this sample, the most common studio size is 1000 square feet.

If an architect was hired to plan a building with a number of studios, he or she might want to know what studio sizes were most common. Often the common sizes are most popular with artists. You can think of classroom sizes as a comparison. What are the most popular sizes for classrooms? Too small– not good… too large– too cold, not intimate…

Add studios to this graph so that the mode will change to 1300 feet.

Add studios to this graph so that there are two modes 800 square feet and 1100 square feet.

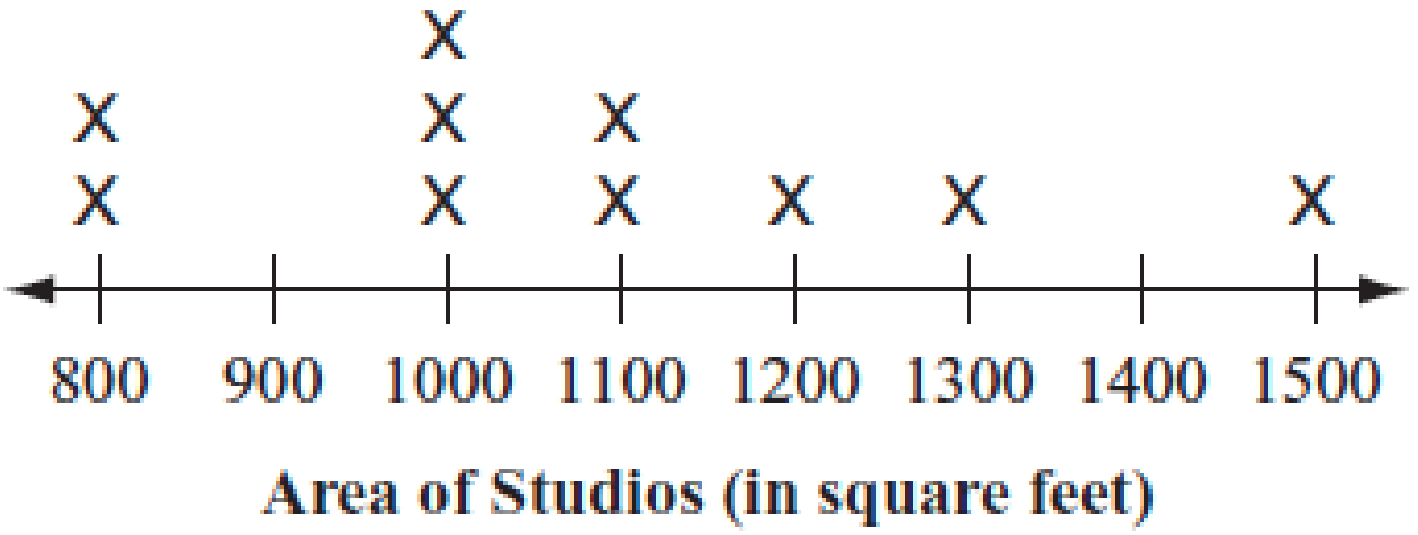
6 The line plot below shows the area, in square feet, of each studio in an art center.



You own these studios. Each month the 10 artists, who each rent a studio, give you a rent check for their studio space. You charge $2 per square foot. How much will you receive for the largest space? Show your work.

Rate per sq. ft * size of studio = amount collected
$2/per square ft * 1500 sq ft. = $3000

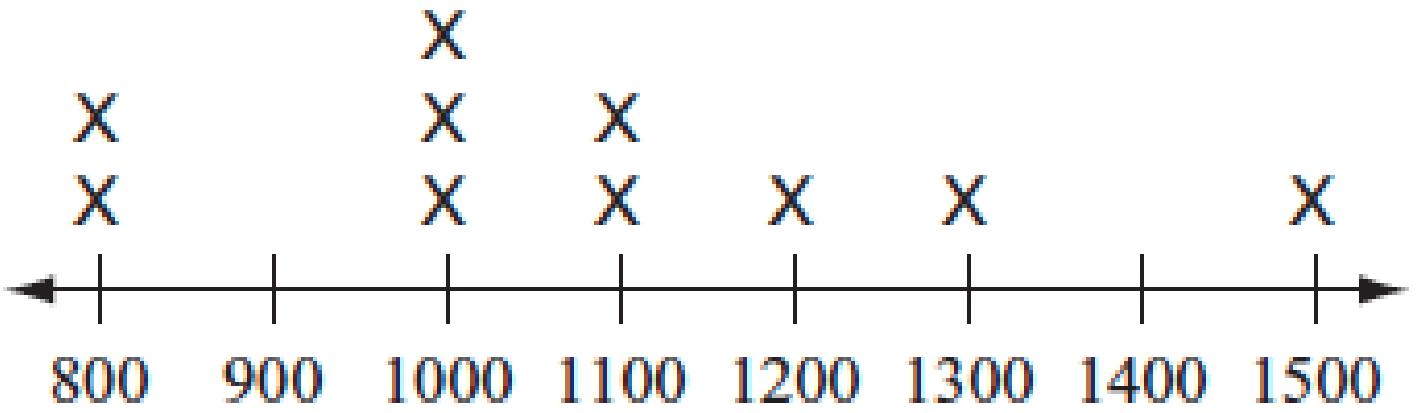
6 The line plot below shows the area, in square feet, of each studio in an art center.



You own these studios. Every month each of the 10 artists give you a rent check for the studio. You charge $2 per square foot. How much will you receive in total for the two smallest spaces? Show your work.

Rate per sq. ft * size of studio * studios = amount collected
$2/per square ft * 800 sq ft * 2 studios = $3200

6 The line plot below shows the area, in square feet, of each studio in an art center.



Area of Studios (in square feet)

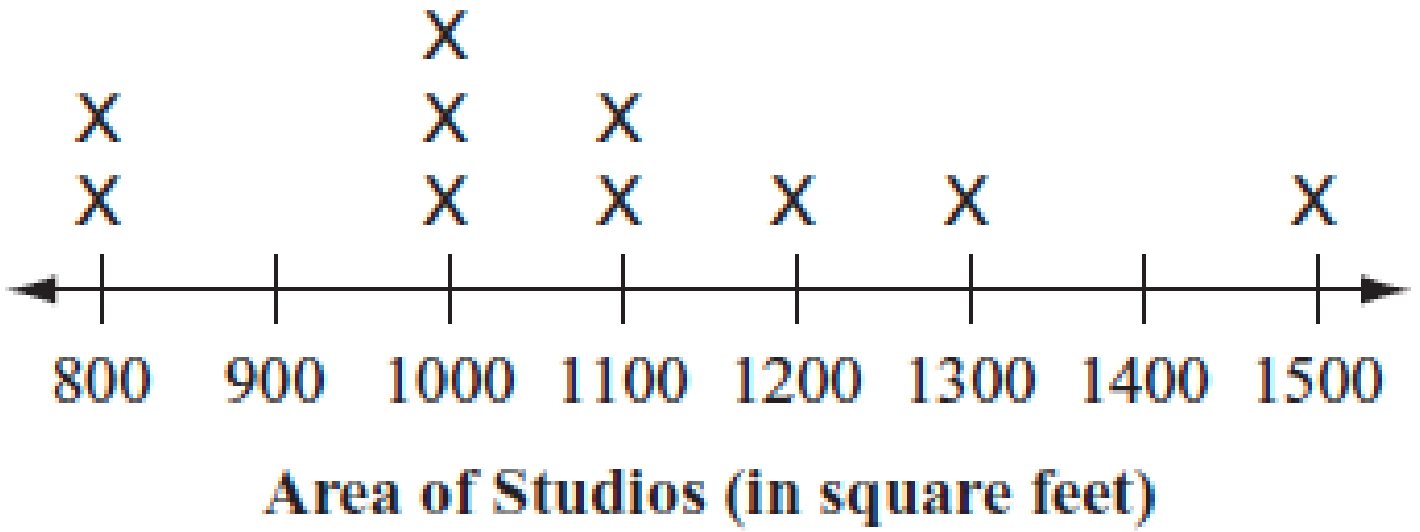
Assuming the studios are rectangular, what are the likely dimensions of the largest studio?

L * w = area

L * w = 1500 sq. ft

Two of many possibilities: 50ft * 30ft = 1500 sq ft. (square-ish) or 75 ft by 20 feet (long narrow)

6 The line plot below shows the area, in square feet, of each studio in an art center.



What are the likely dimensions of the smallest studio?

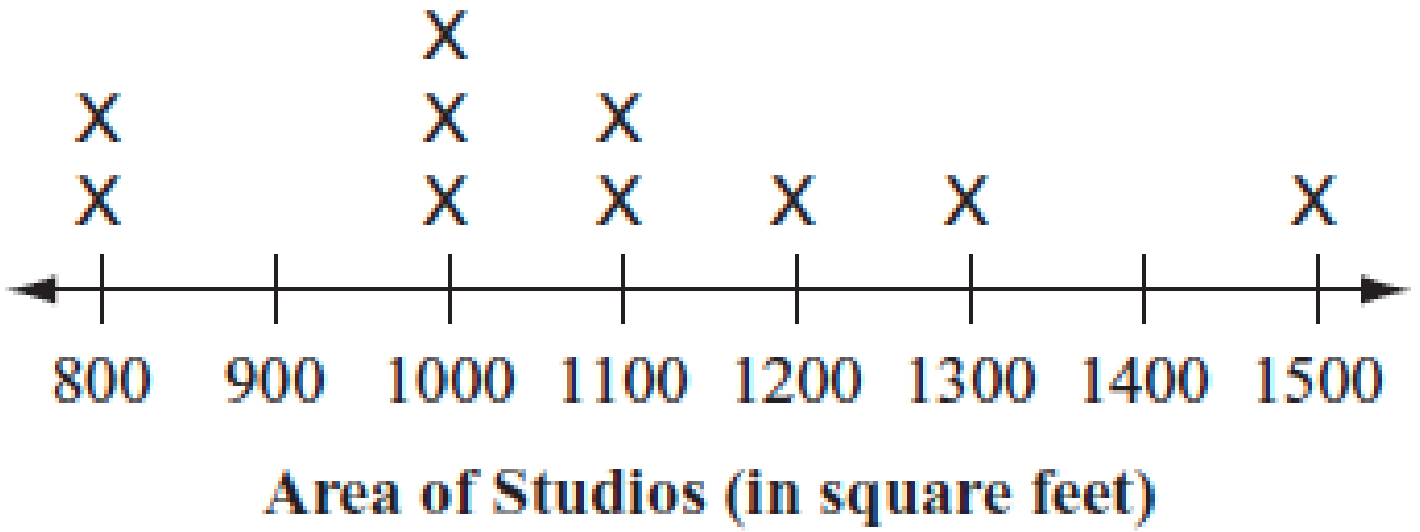
L * w = area

L * w = 800 sq. ft

40ft * 20ft = 800 sq. ft (square-ish) Or 50 ft by 16 ft (long and narrow)

80 ft by 10 ft (really long and narrow)

6 The line plot below shows the area, in square feet, of each studio in an art center.

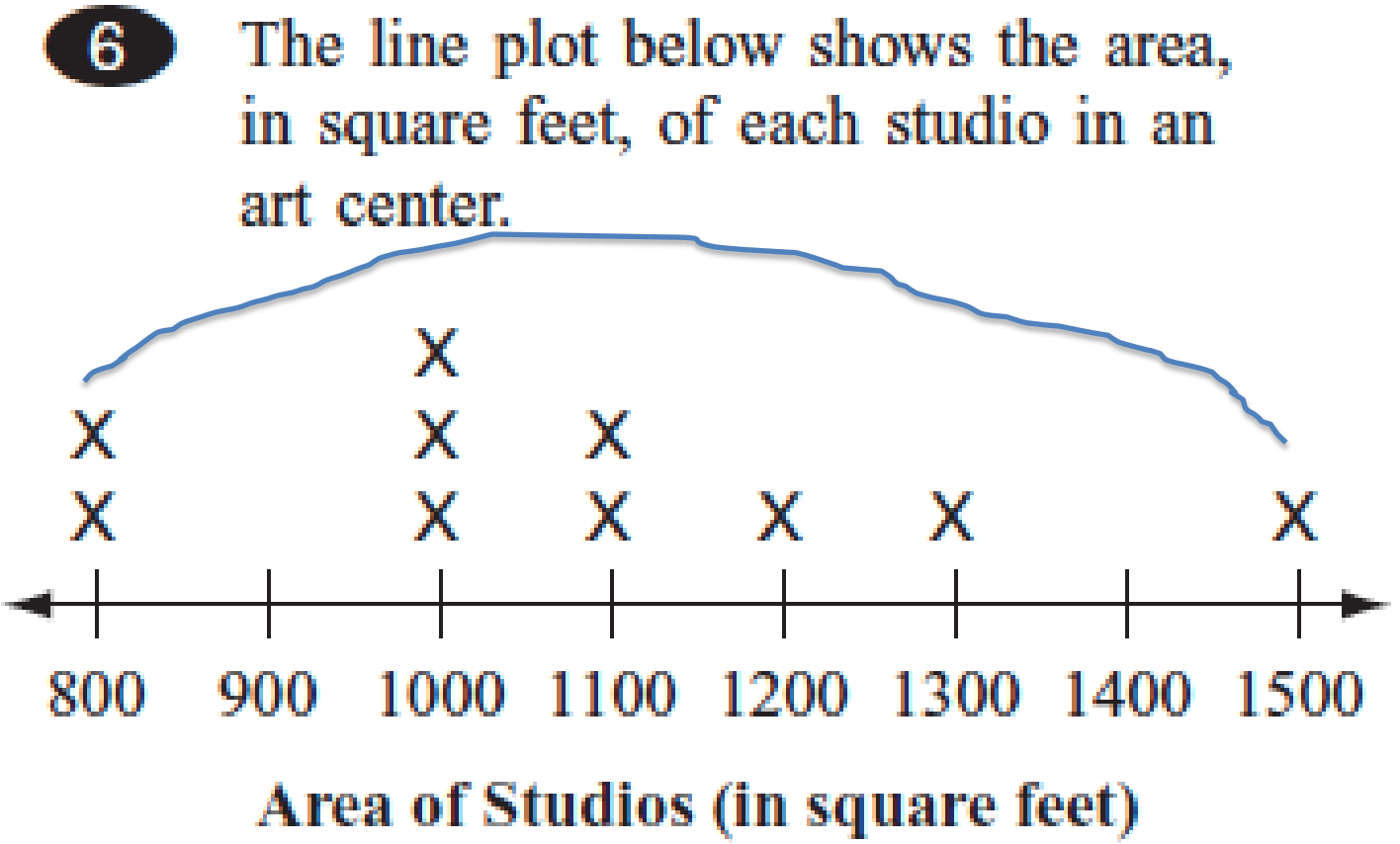


What is the range for studio size?

Range = maximum – minimum

R = 1500 - 800

R = 700 sq. ft



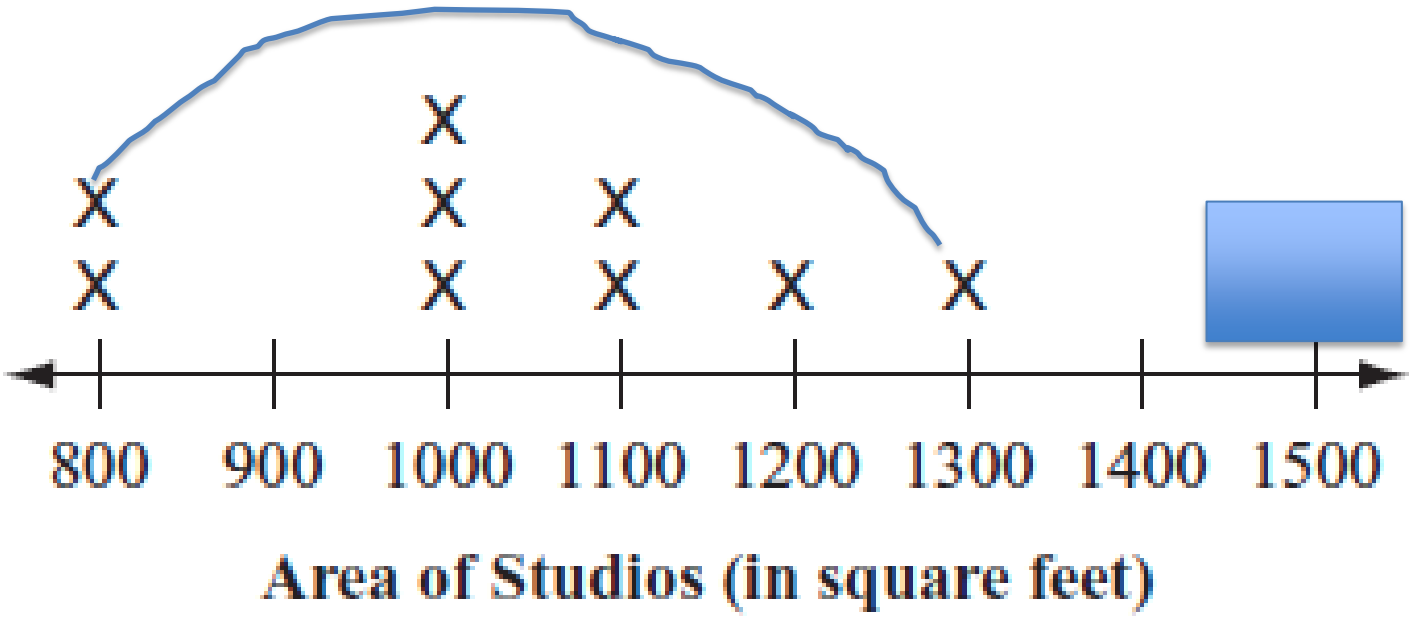
Eliminate the studio that measures 1500 sq. feet. What is the range now? Show your work

Range = maximum – minimum

R = 1300 - 800

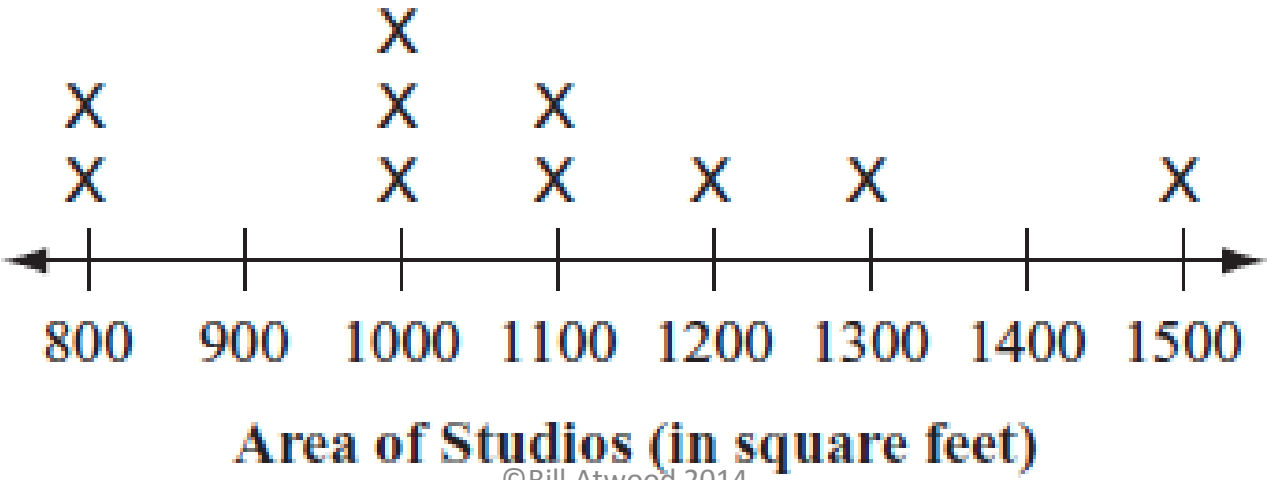
R = 500 sq. ft

6 The line plot below shows the area, in square feet, of each studio in an art center.



As the owner of the building, is it good to have a large range of studio sizes available for rent? Turn to your neighbor, explain your answer briefly. Make a few notes on your whiteboard.

6 The line plot below shows the area, in square feet, of each studio in an art center.



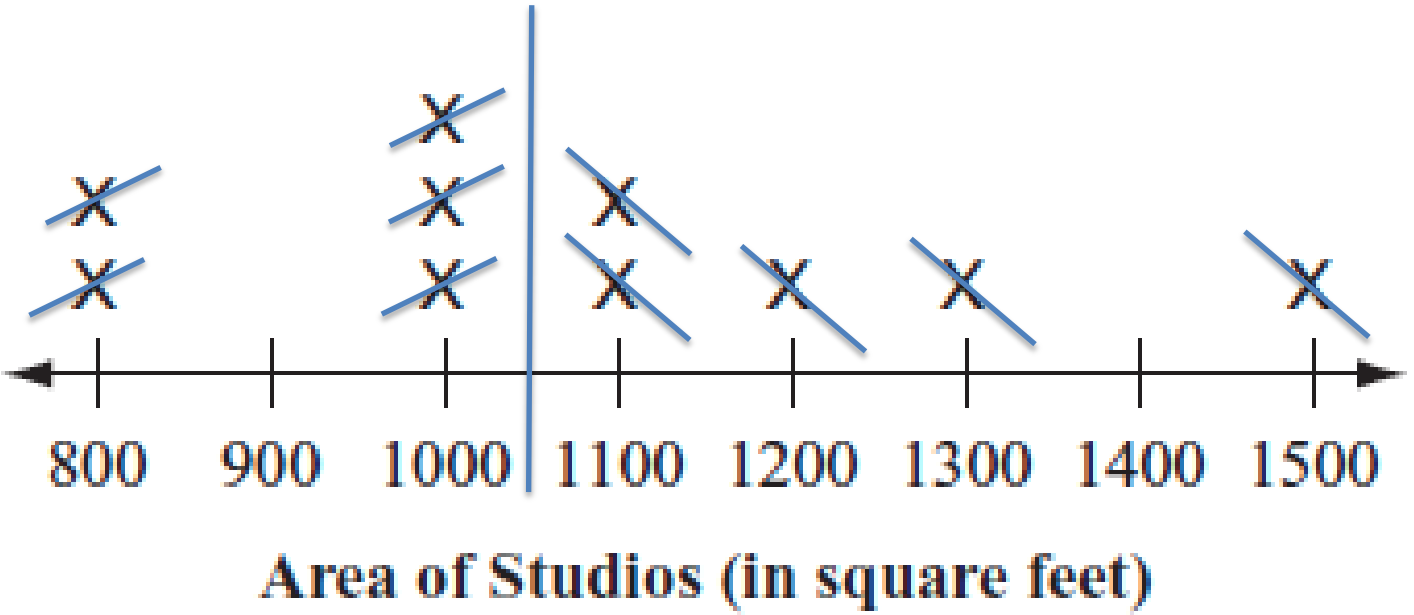
A large range might be good because you could accommodate the needs of different artists. If someone needs a large space and can afford it, you can offer a large space of 1500 feet. Someone else might be looking for a small space because they have a limited budget. If you have a large range of space sizes, then you can have more to offer.

Having a small range might be advantageous also. For example, converting the large studio into two smaller ones might make sense if there was a great demand for small studios. So, in some situations, it might make sense to have a smaller range of studios, but only if you knew the demand and knew the large spaces would go unrented.

Find the median of the studio sizes. Show your work.

$\frac{1000 + 1100}{2} = 1050$ range of studios is 1050 sq. feet.

6 The line plot below shows the area, in square feet, of each studio in an art center.

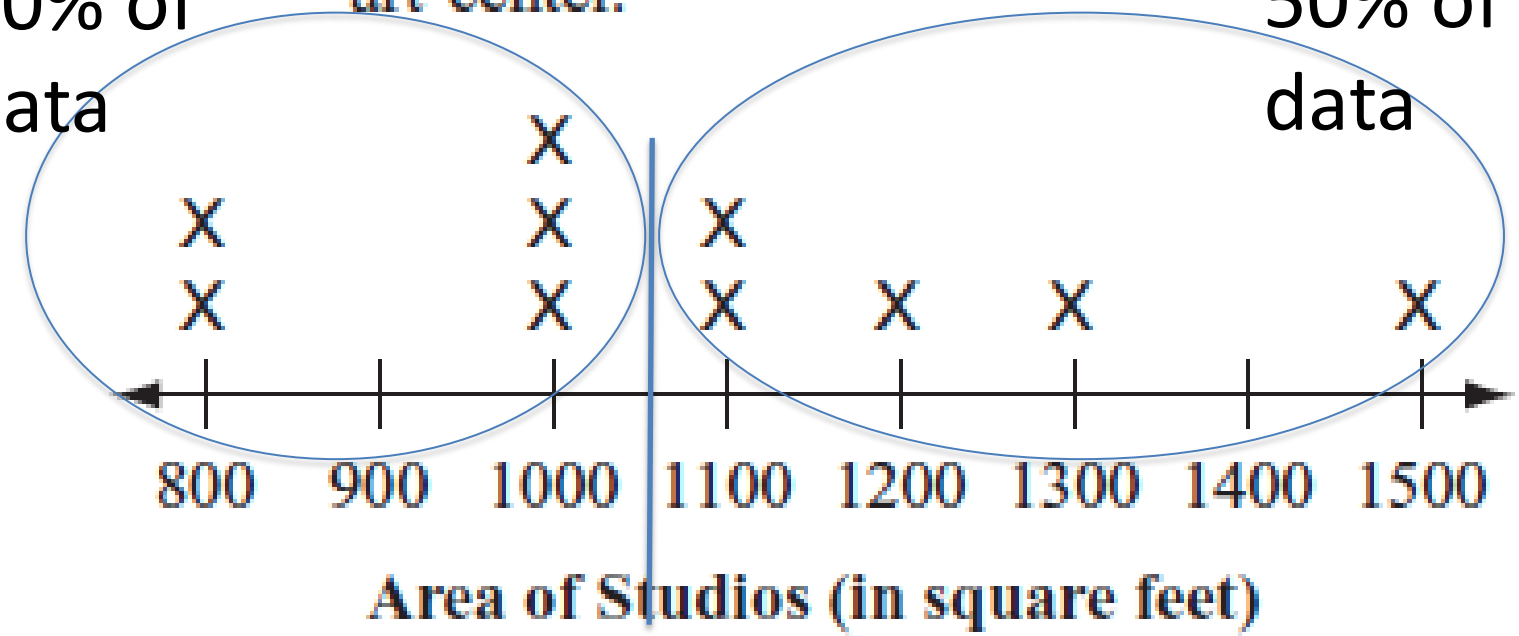


1050

Another way to see it… 10 points ÷ 2 = 5

5 points above 5 points below.

6 The line plot below shows the area, in square feet, of each studio in an art center.



50% of data

50% of data

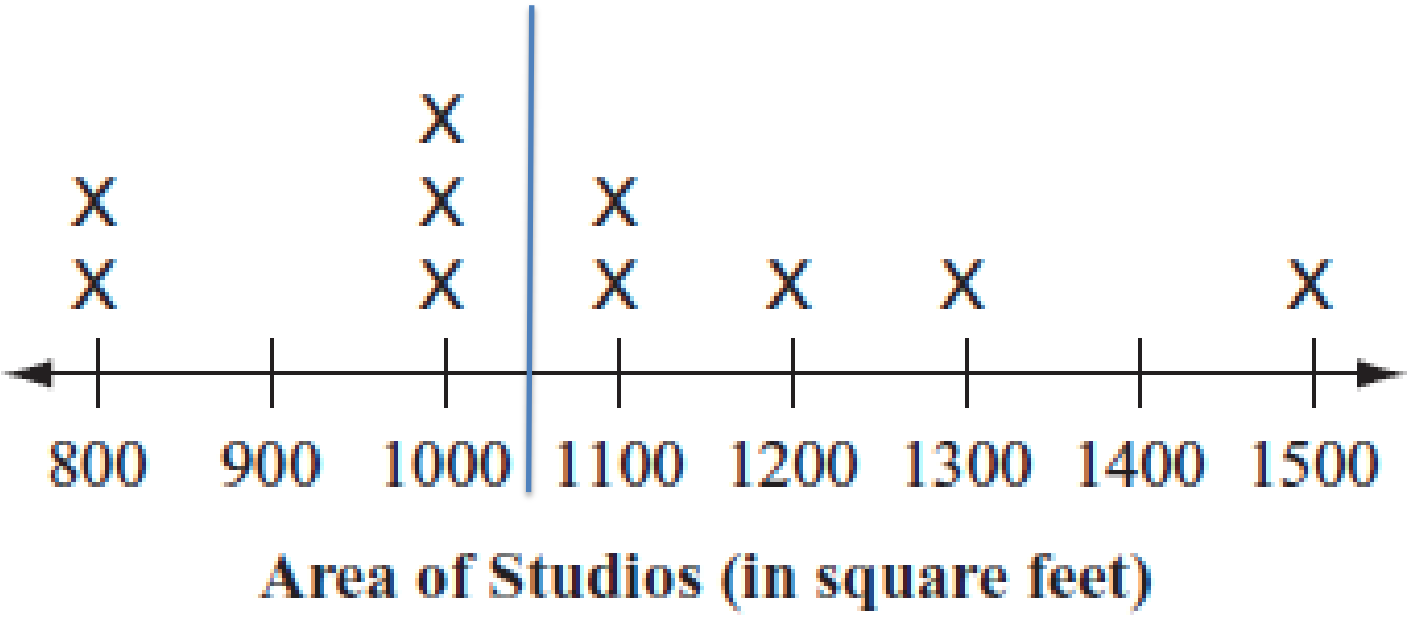
1050

What fraction of the studios are above 1050? 5/10 =1/2

What fraction of the studios are below 1050? 5/10 =1/2

What % of the studios are below 1050? Below? 50% 50%

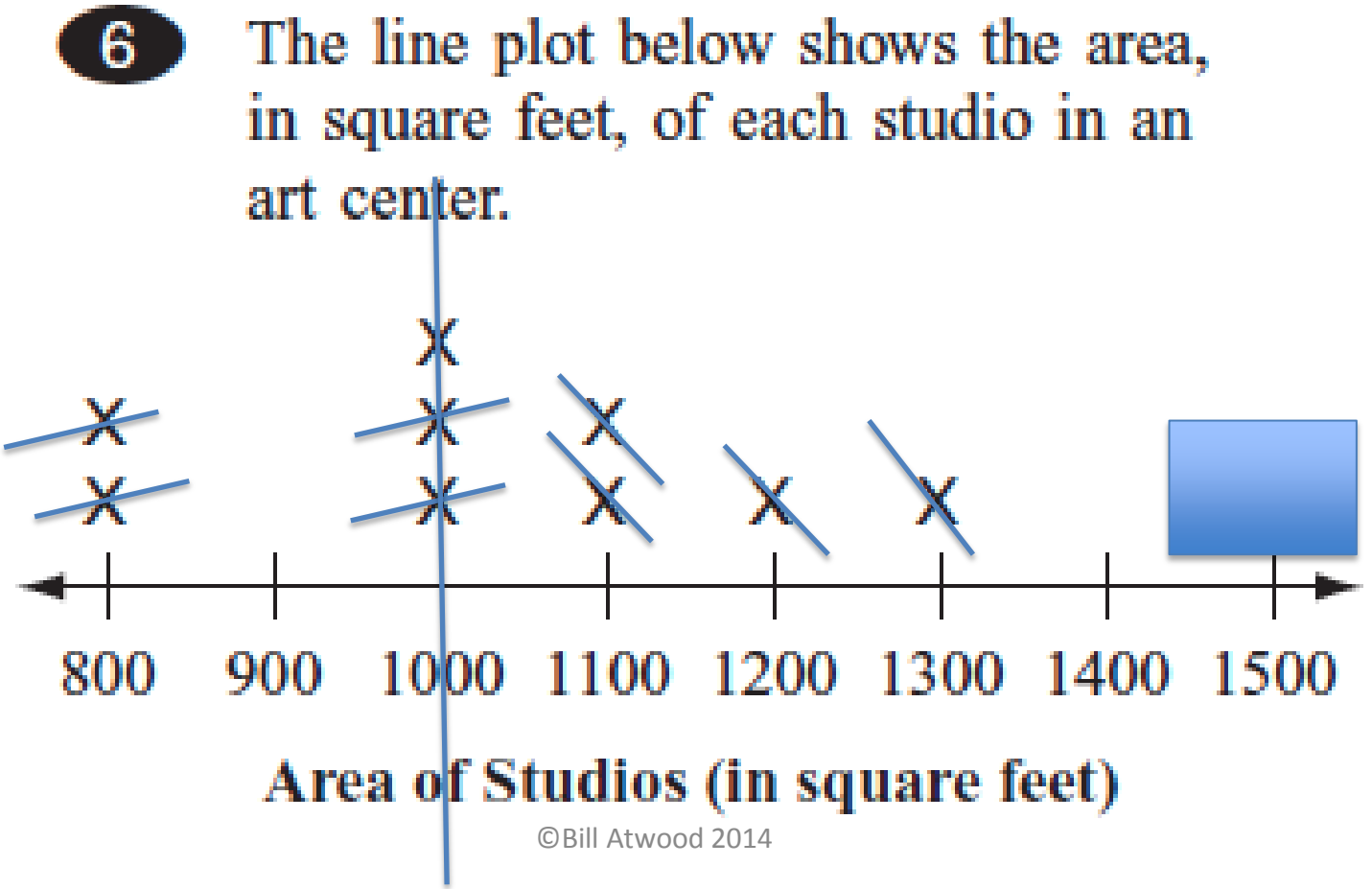
6 The line plot below shows the area, in square feet, of each studio in an art center.



1050

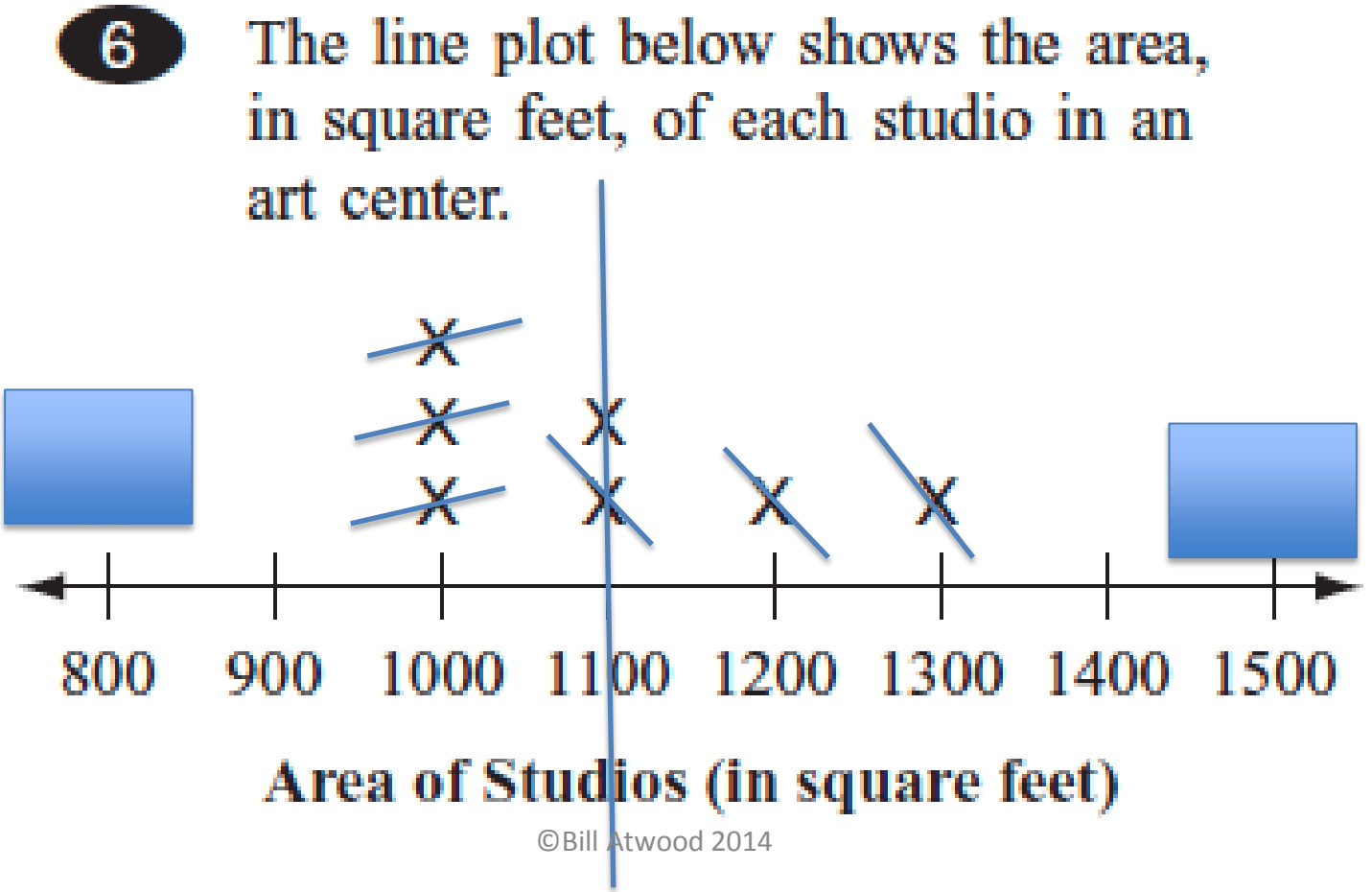
Eliminate the studio with 1500 square feet. What is the new median?

1000 square feet is the new median. 50% of data equal or above 1000 and 50% equal or below 1000 square feet.



Eliminate the studio with 1500 square feet. And the two studios of 800 feet. What is the new median?

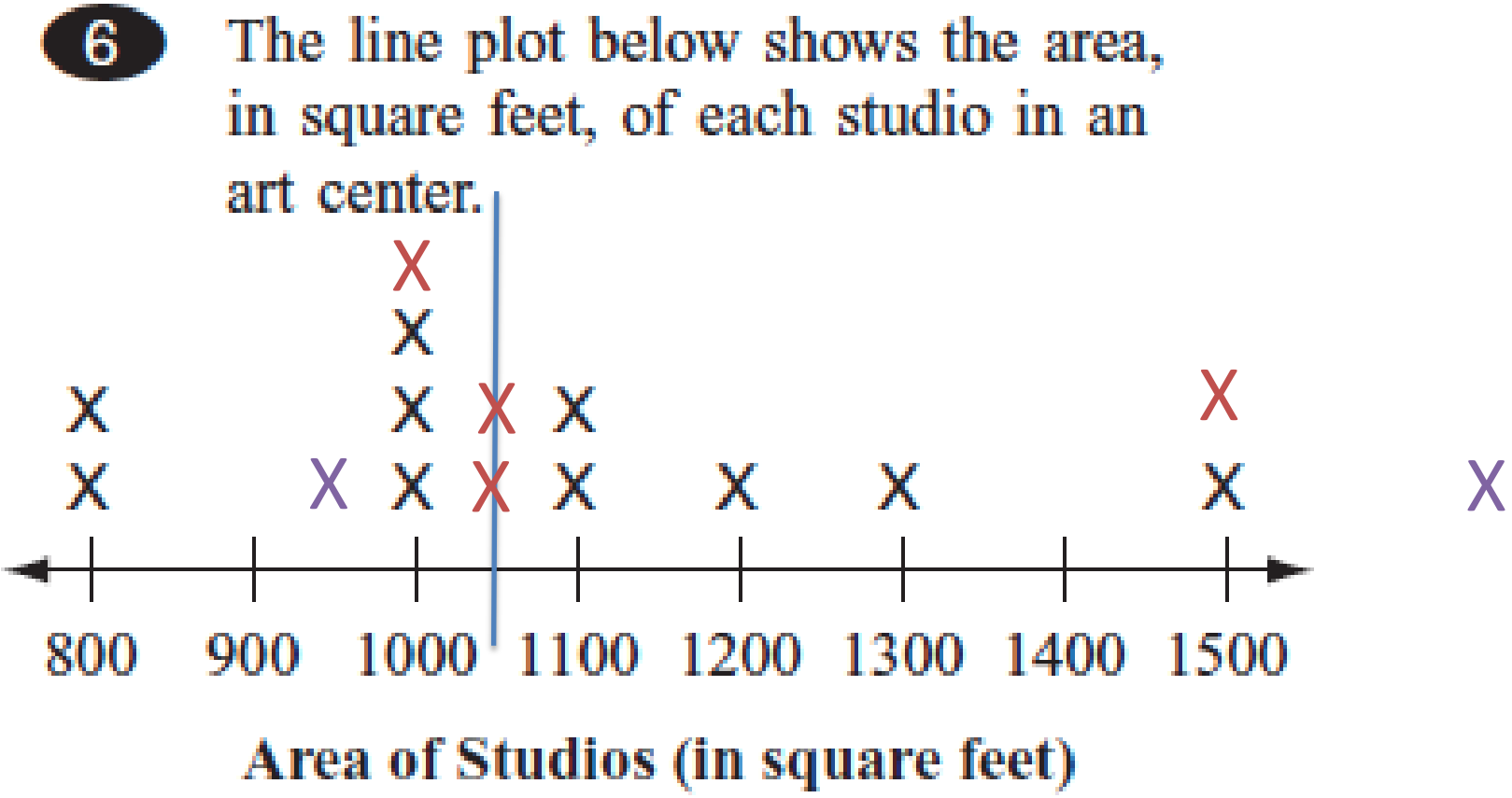
1100 square feet is the new median. 50% of data equal or above 1100 and 50% equal or below 1100 square feet.



The median is 1050. Add two studios that won't change the median area.

Or…

Add a studio any above as long as you add one below the median. Or add studios on the median!



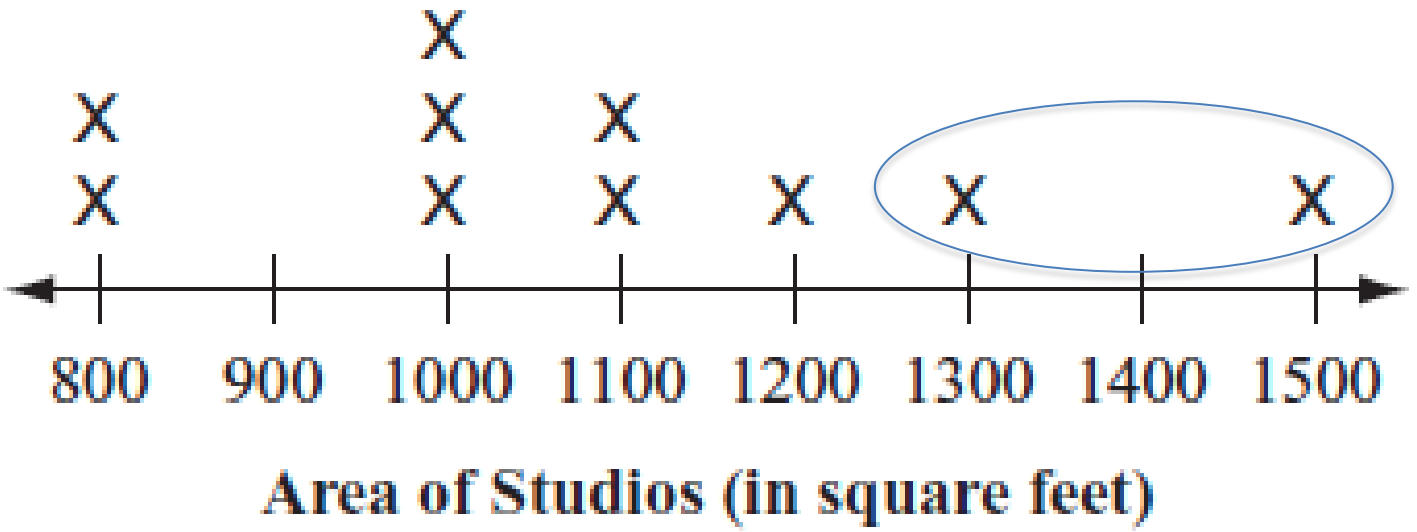
1050

What fraction of studios are greater than 1200 sq. feet?

What percent? 2/10 = 20/100 = 20%

2/10

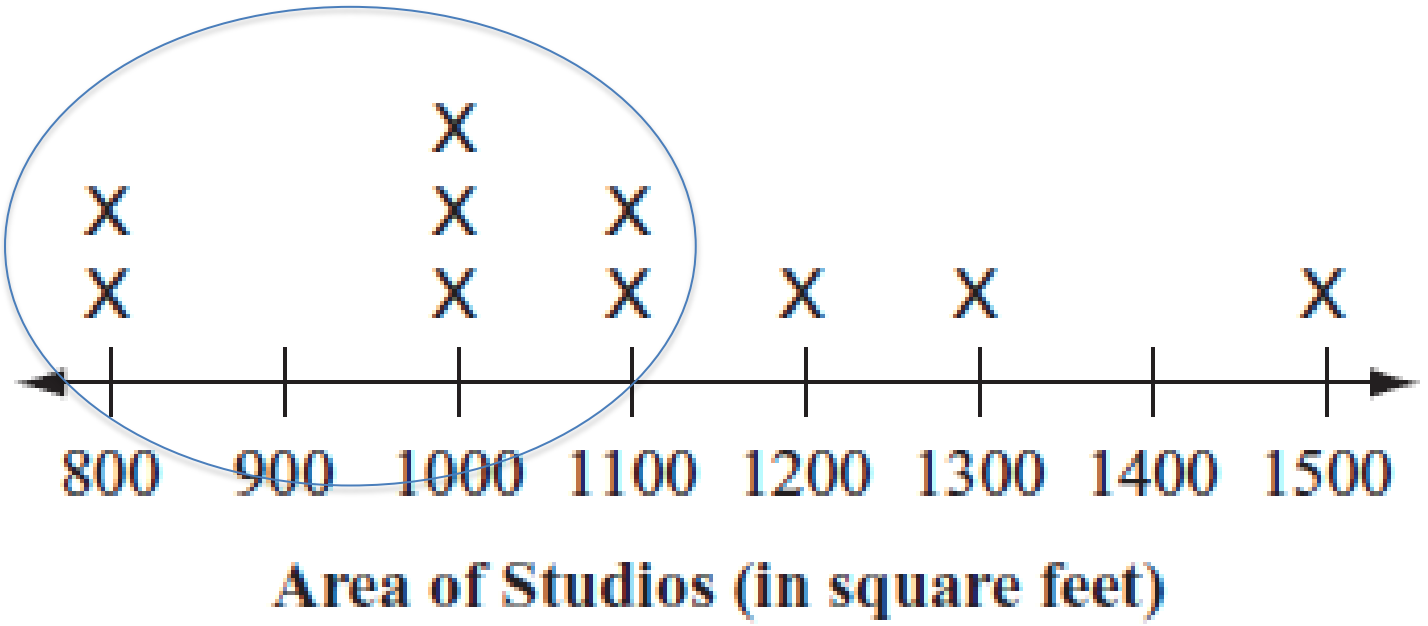
6 The line plot below shows the area, in square feet, of each studio in an art center.



What fraction of studios are less than 1200 sq. feet? 7/10

What percent? 7/10 = 20/100 = 70%

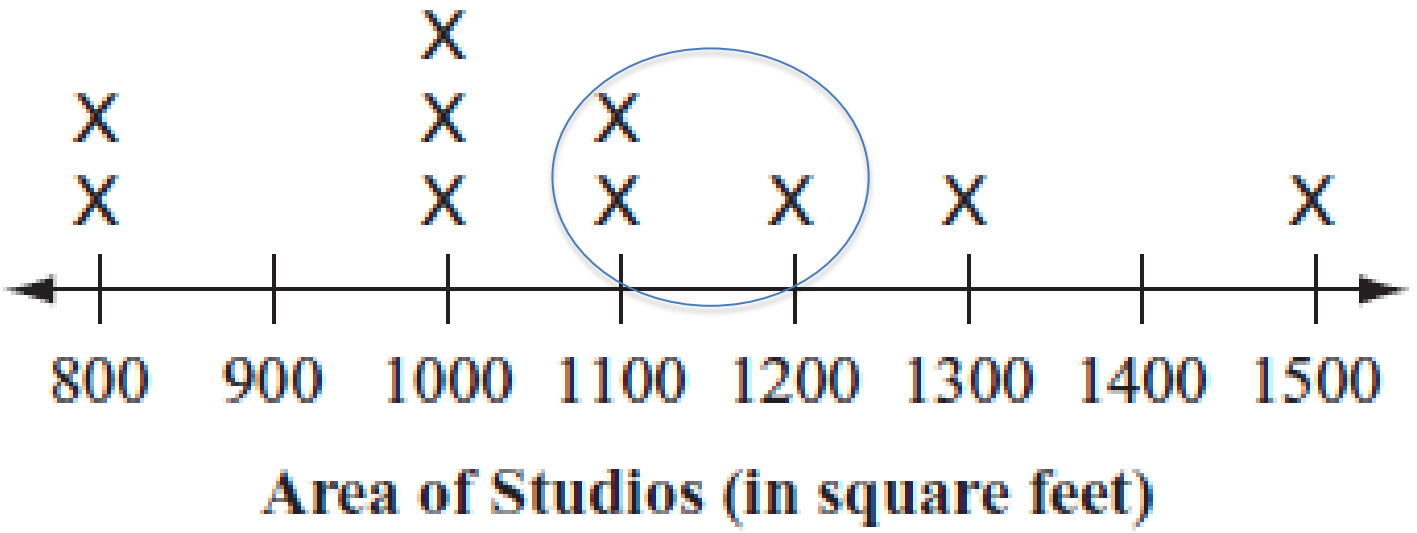
6 The line plot below shows the area, in square feet, of each studio in an art center.



What fraction of studios are greater than 1000 sq. feet but less than 1300 square feet? (1000< X < 1300) 3/10

What percent? 3/10 = 30/100 = 30%

6 The line plot below shows the area, in square feet, of each studio in an art center.

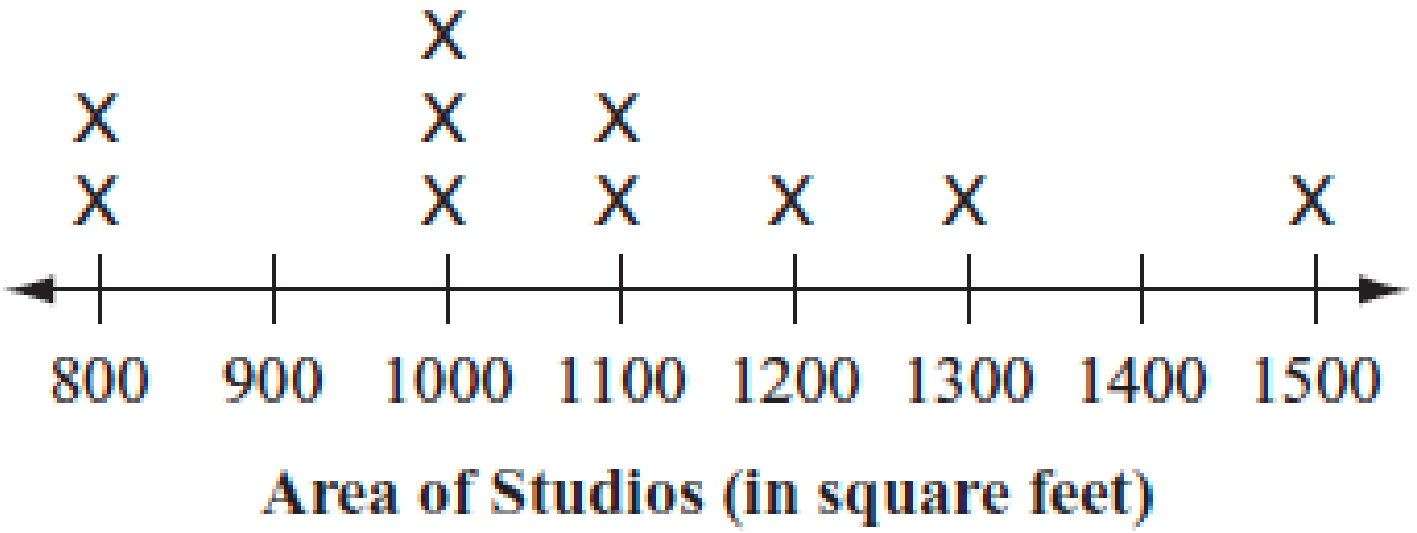


Make a statement on your white board, that has an answer of 80% (8/10 = 4/5) of the studios.

Is this correct? 80% of studios that are less than or equal to 1300 feet.

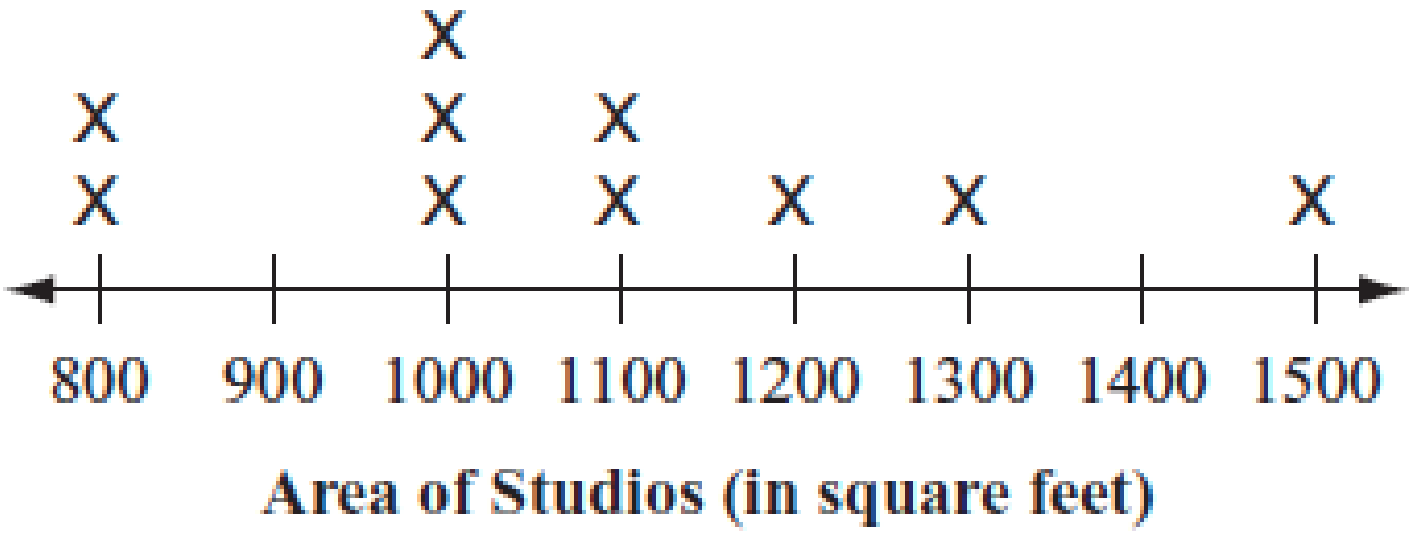
No. 80% of studios that **<u>are less than</u>** 1300 feet.

6 The line plot below shows the area, in square feet, of each studio in an art center.

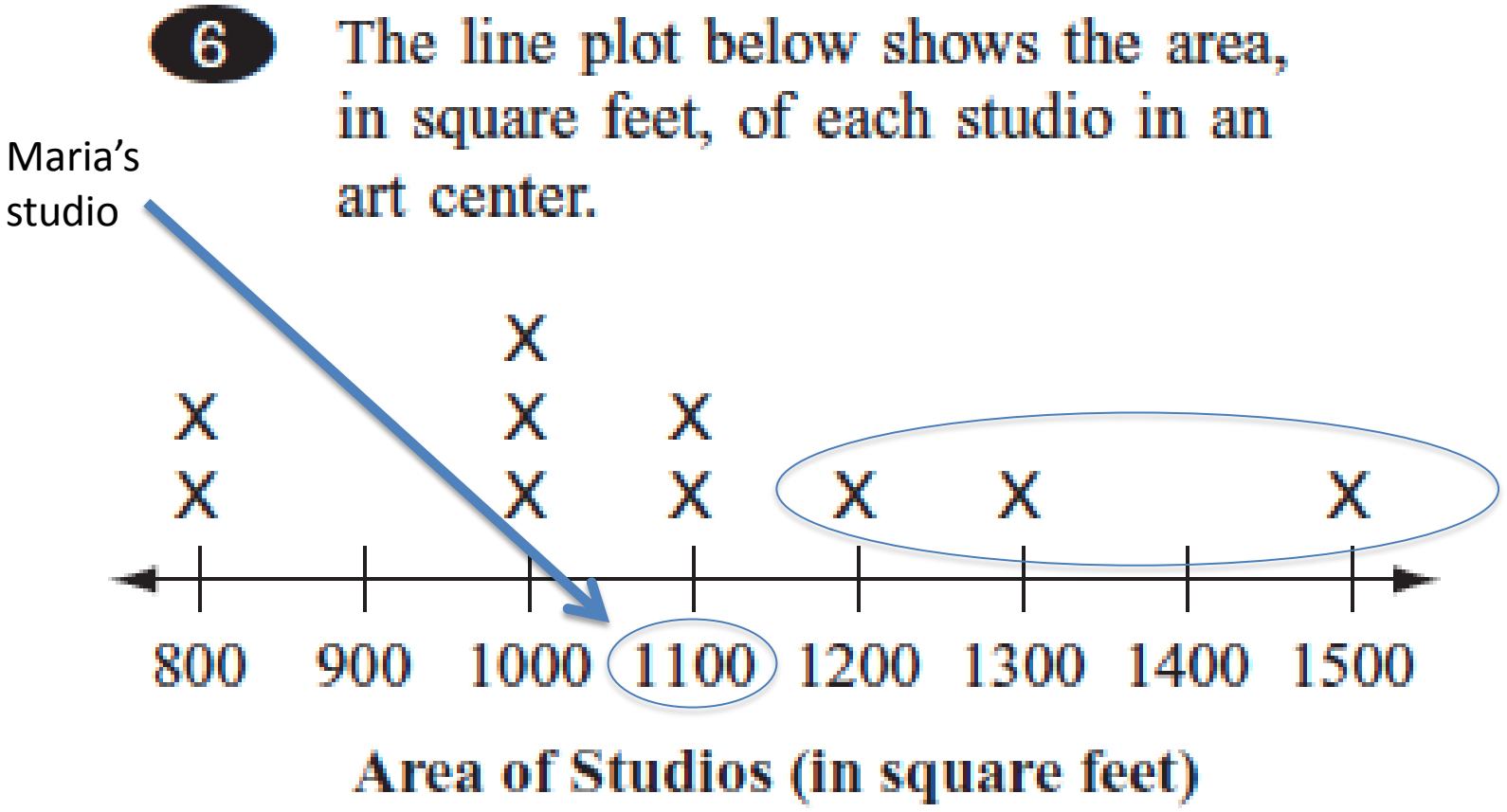


Make a statement on your white board, that has an answer of 10% of the studios.

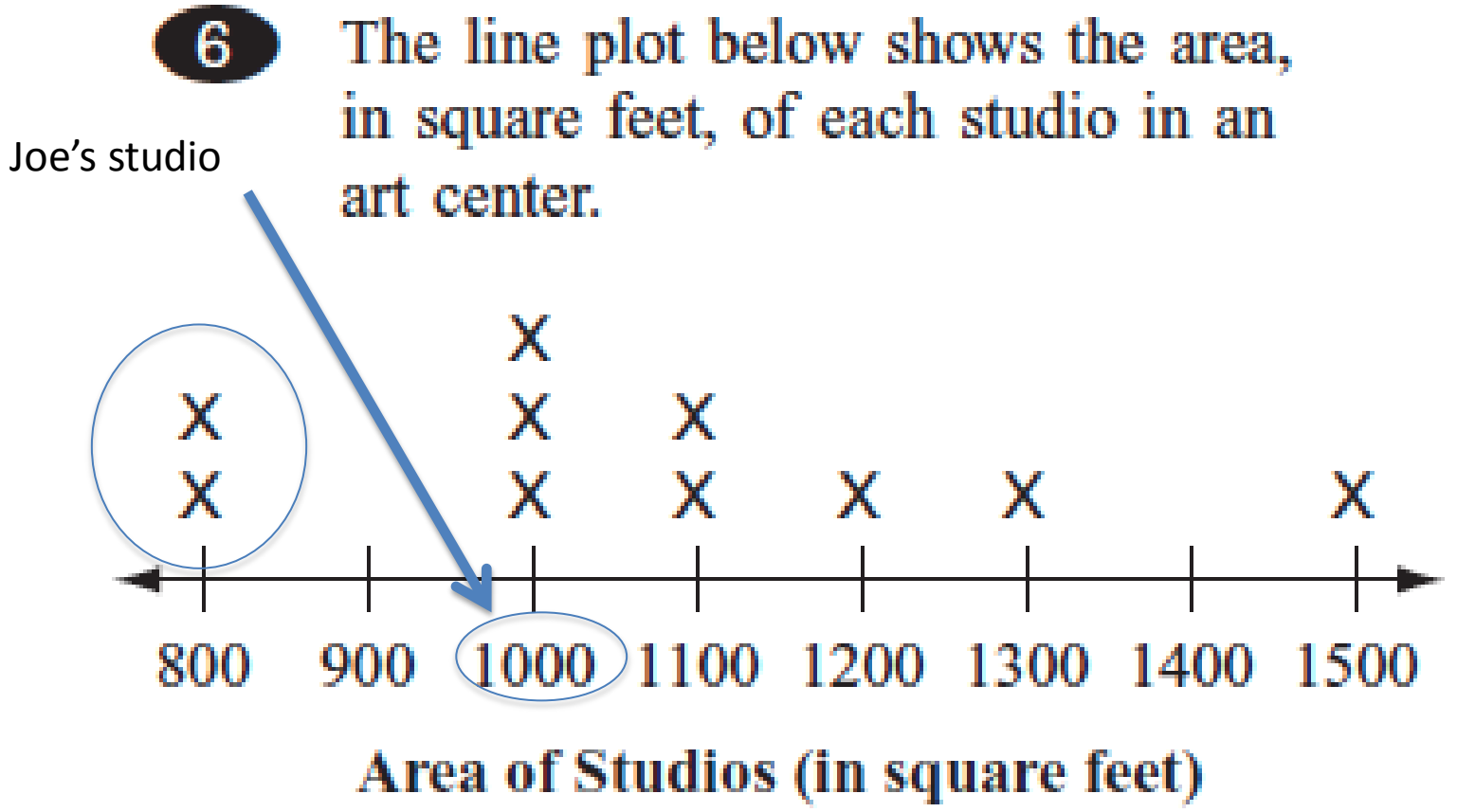
6 The line plot below shows the area, in square feet, of each studio in an art center.



Only three studios had more area than Maria's studio. Circle the area of Maria's studio.

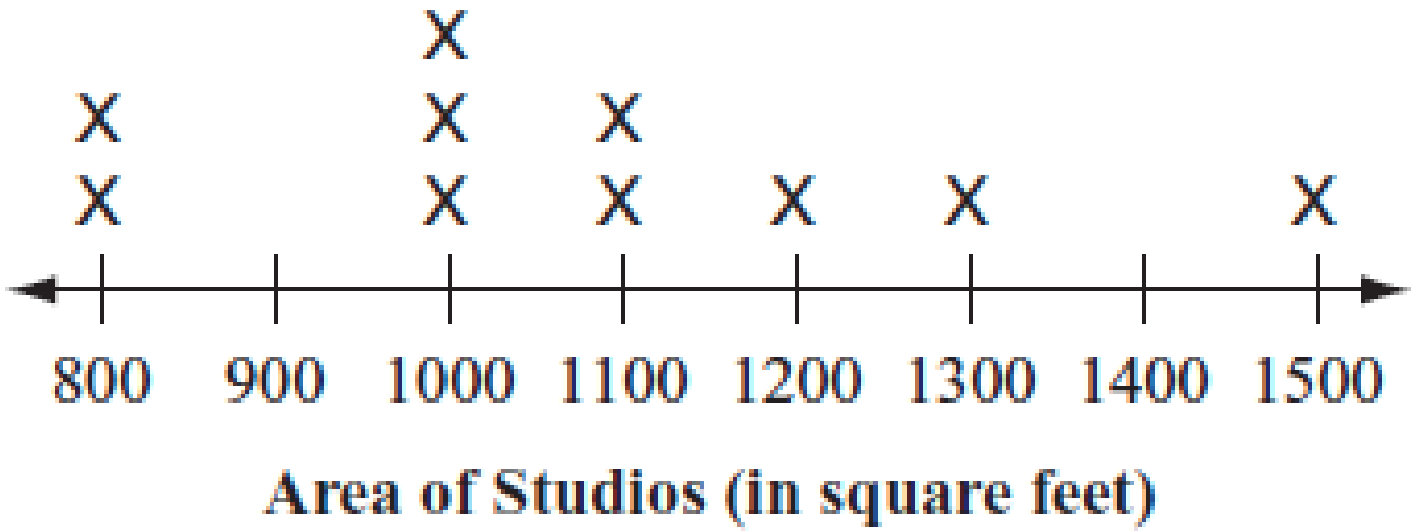


Only two studios were smaller than Joe's studio. Circle the area of Joe's studio.



Only ____ studios are greater/smaller than mine. Make up your own question. Raise your hand.

6 The line plot below shows the area, in square feet, of each studio in an art center.



Find the mean area of the studios.

The sum of the studio areas is 10,800 sq. feet

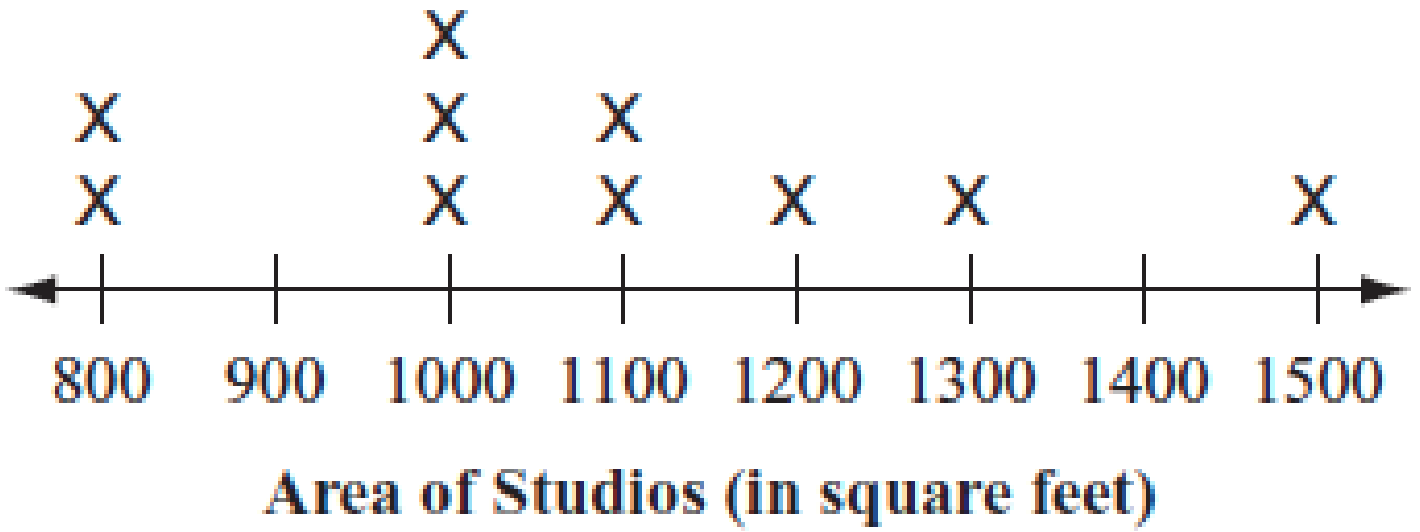
Show your work

Mean = Sum of data/# of data points

10800/10 = 1080

Mean = 1080 sq. ft

6 The line plot below shows the area, in square feet, of each studio in an art center.



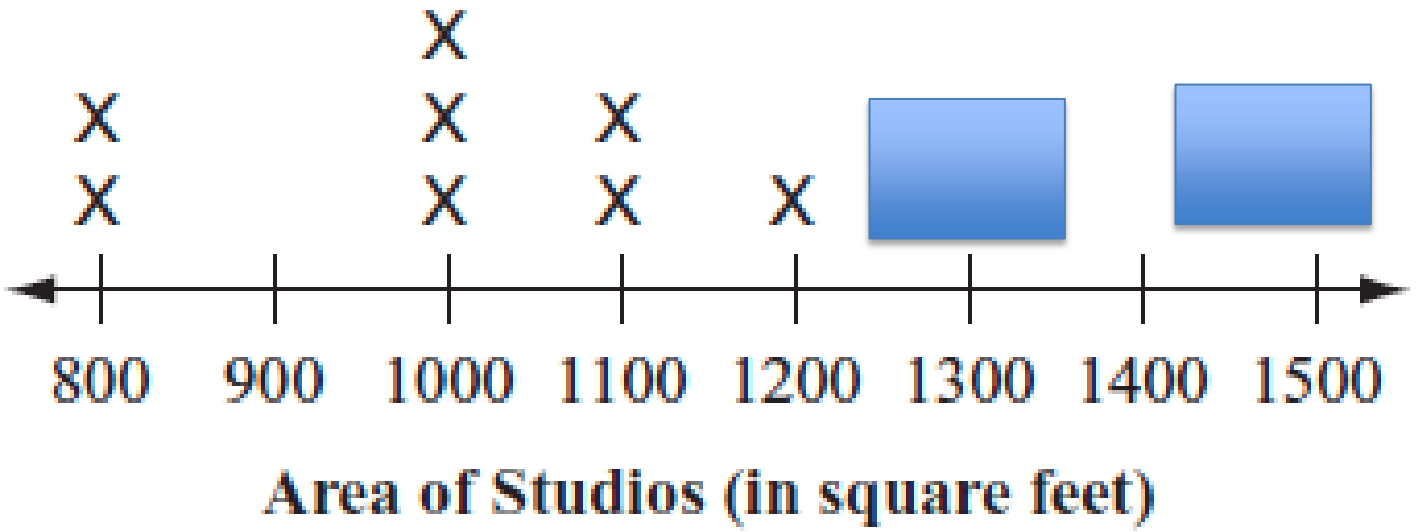
Eliminate the 1,300 and 1,500 studios. Find the mean area of the remaining studios.

Mean = Sum of data/# of data points

[(2(800) + 3(1000) + 2(1100) + 1200](1/8) = 1000

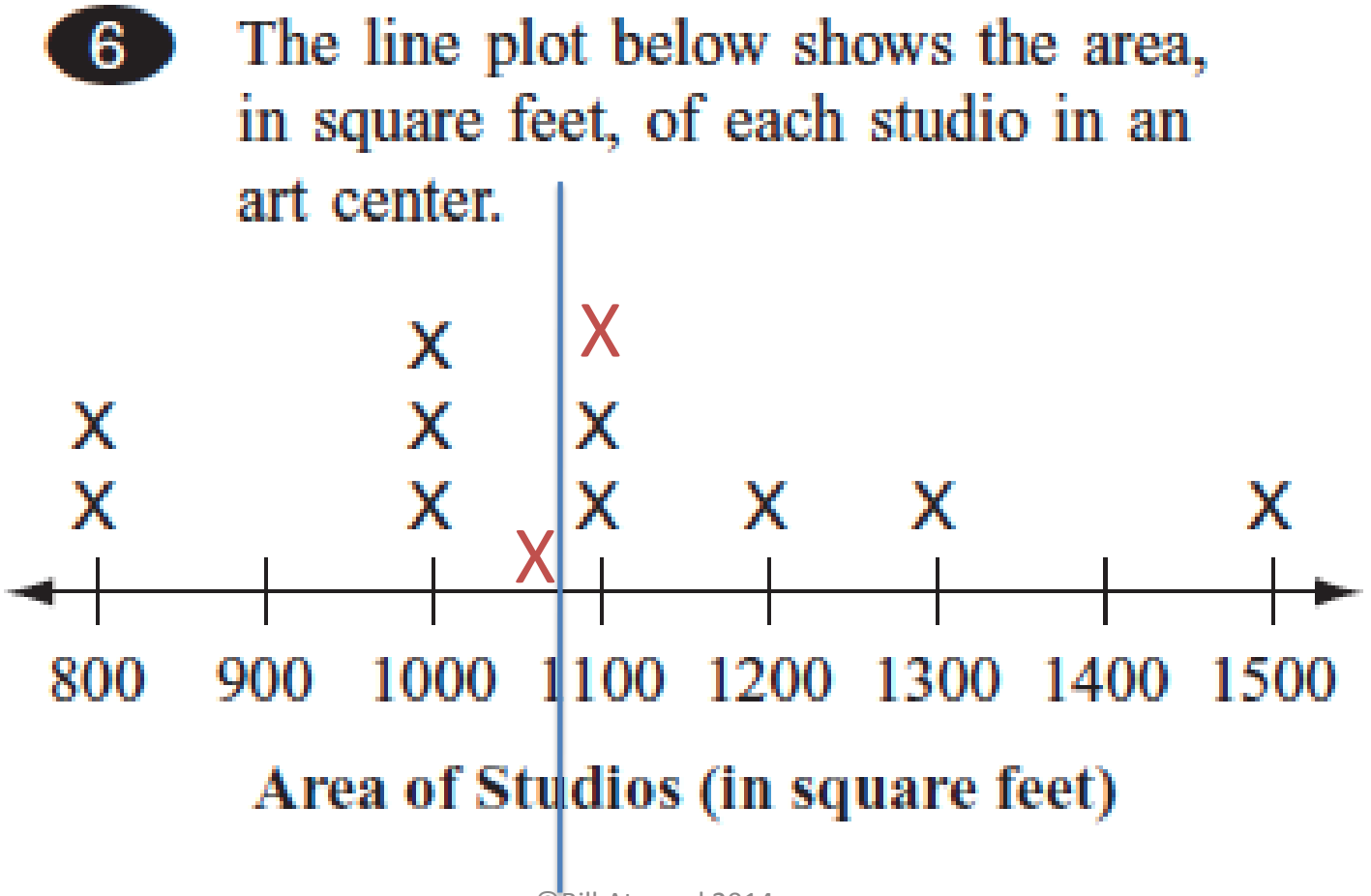
Mean = 1000 sq. ft

6 The line plot below shows the area, in square feet, of each studio in an art center.



If the mean is 1,080 sq. feet add 2 studios that won't change the mean.

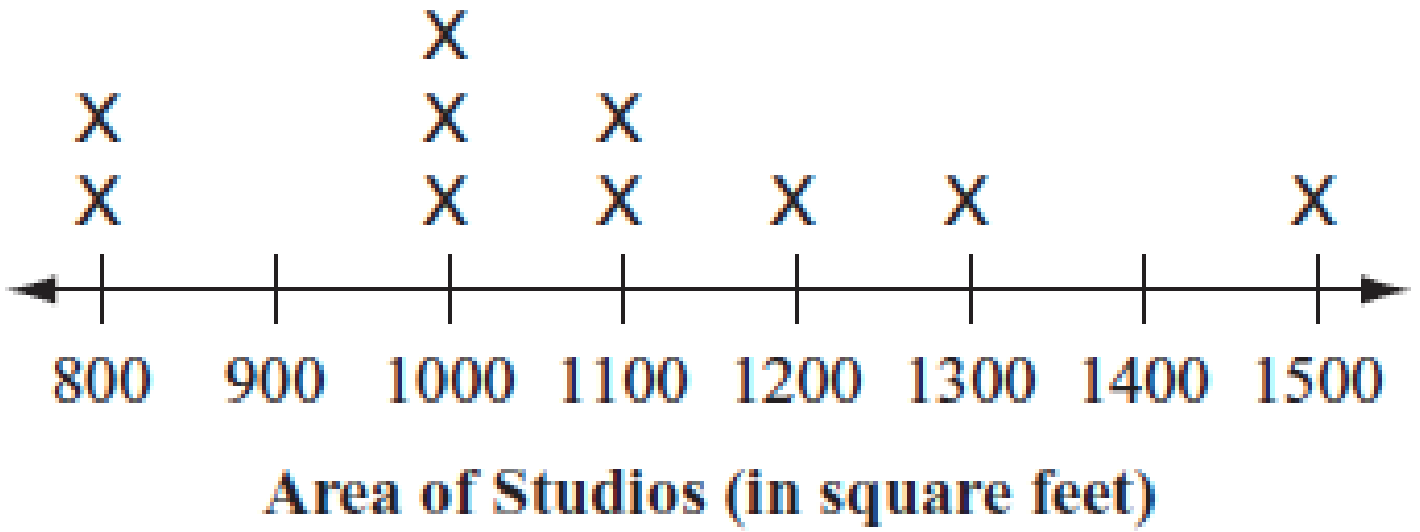
Mean = 1080 one solution:
Add 1100 (20 higher) and 1060 (20 less)



If you had a group of 10 studios with a mean of 1300 square feet. What would be the sum of the areas?

1300 * 10 studios = 13,000

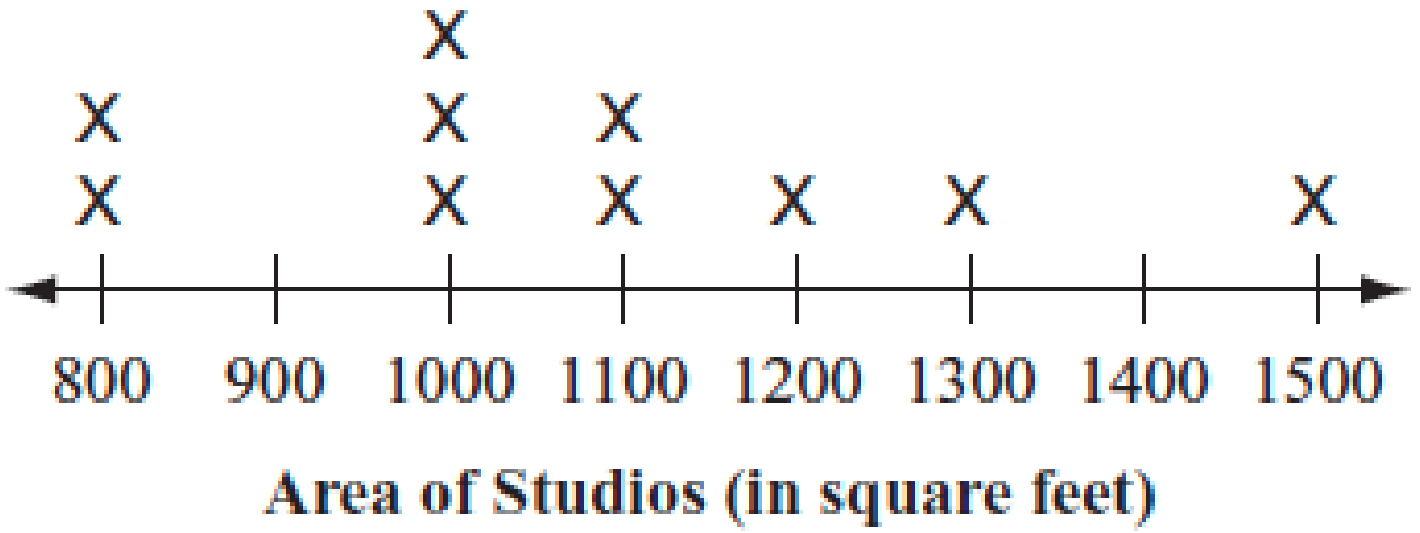
6 The line plot below shows the area, in square feet, of each studio in an art center.



If you had a group of 10 studios with a mean of 800 square feet. What would be the sum of the areas?

800 * 10 studios = 8,000

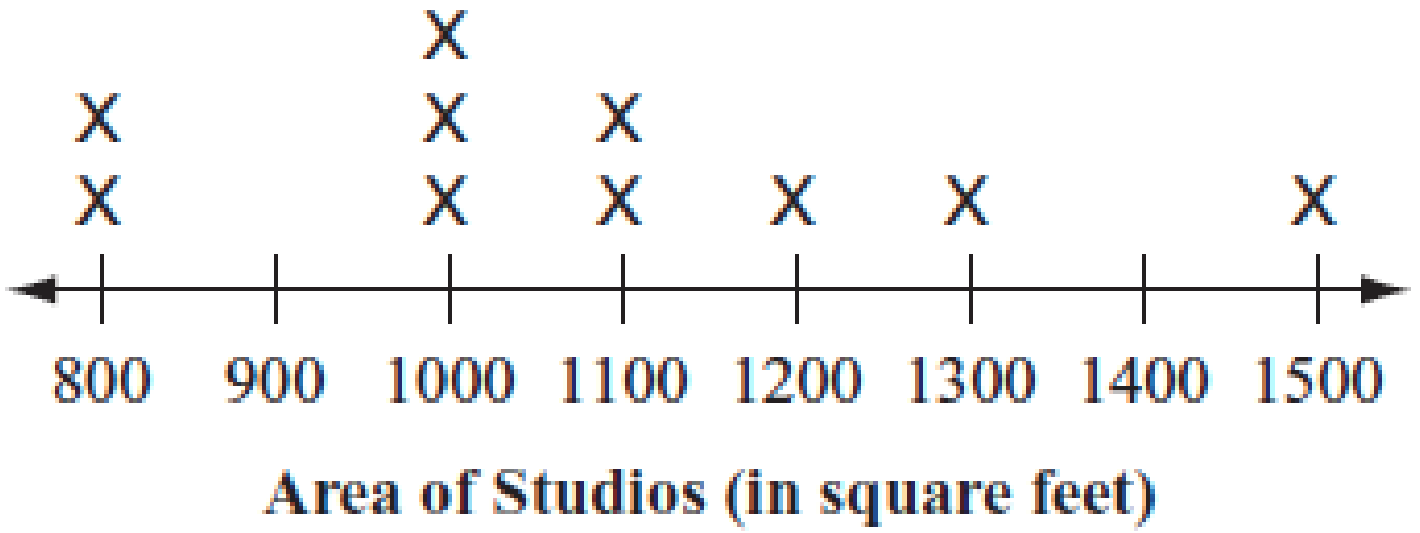
6 The line plot below shows the area, in square feet, of each studio in an art center.



If you had a group of 11 studios with a mean of 800 square feet. What would be the sum of the areas?

800 * 11 studios = 8,800

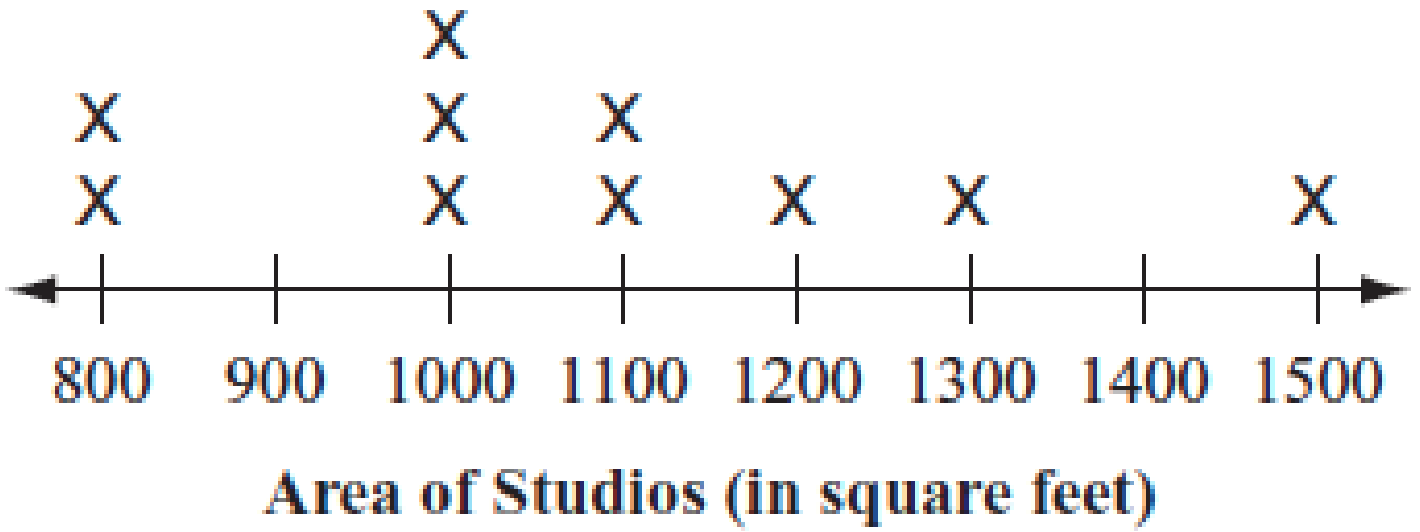
6 The line plot below shows the area, in square feet, of each studio in an art center.



Here you have a group of 10 studios with a mean of 1080 square feet. What is the sum of the areas?

1080 * 10 studios = 10,800

6 The line plot below shows the area, in square feet, of each studio in an art center.

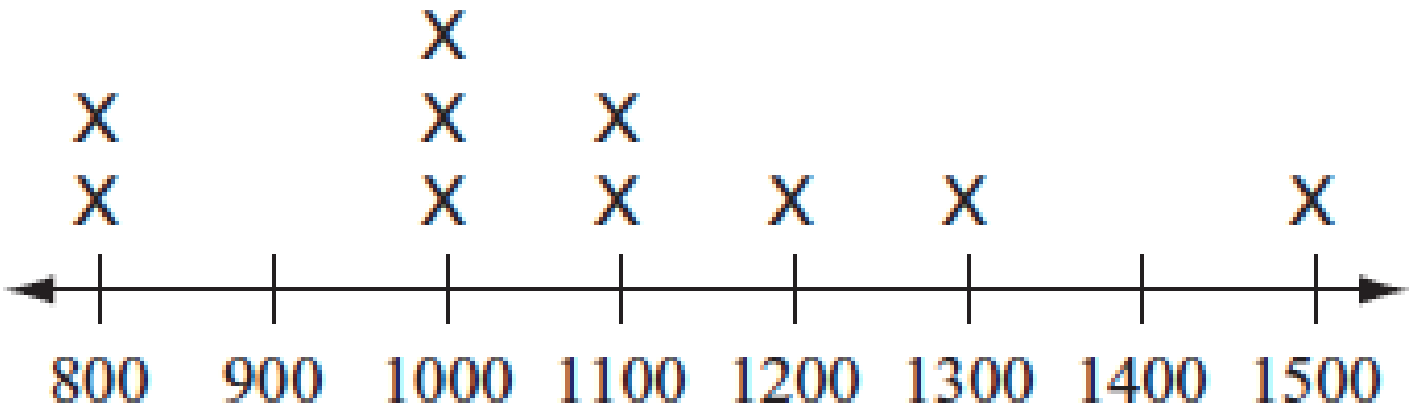


If you wanted to add 1 studio and lower the mean for 11 studios to 1000. What size studio would you add?

1000 * 11 studios = 11,000 new total.

10,800 now. 11,000 – 10,800 = 200 add a 200 sq. ft studio

6 The line plot below shows the area, in square feet, of each studio in an art center.



Imagine there a new studio added to this sample. It was 4000 square feet. Which would it affect more... the mean or the median? Why?

Old Median = 1050
New Median = 1100
Change in median = 50

Old mean = 10800/10 = 1080
New mean = 10800 + 4000 = 14,800
14,800/ 11 = 1345.45
Change in mean = 265.45

6 The line plot below shows the area, in square feet, of each studio in an art center.