Notes Section 1.2 – Visualizing and Graphing Data

Lesson Objectives

1. Analyze one variable data – **mean**, **median**, **range**.
2. Find the distance between two points using the **Distance Formula**.
3. Determine midpoint of a segment with given endpoints using the **Midpoint Formula**.
4. Solve application problems related to the concept of midpoint.
5. Two variable data – Determine the **domain** and **range** and make a **scatterplot** of a **relation**.

A. Analyze One Variable Data

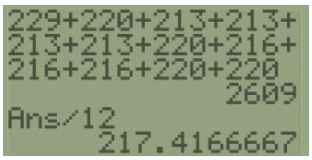
1. Mean (or average) – sum of all data points, divided by number of data points (*n*)

- **EXAMPLE:** Find the mean of the set of data. Round to the nearest tenth
  229, 220, 213, 213, 213, 213, 220, 216, 216, 216, 220, 220 [1.2-7]

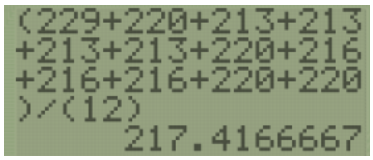
  (Use calculator) Sum = 2609, total data points *n* = 12. Mean = 2609/12 ≈ **217.4**

Recommend you do 2 separate steps (sum first, then divide) – or you may mess up. If you do it all in one calculation, you **MUST** use parentheses! If you don't use parentheses, you may mess up.

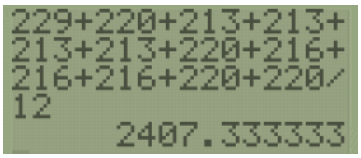
YES



YES



NO



2. Median (or middle) – sort the numbers then go to middle. If 2 numbers, then average them.

- **EXAMPLE:** Find the median of the set of data. 82, 48, 222, 112, 252, 237, 236 [1.2-10]

  Sort the numbers: 48, 82, 112, 222, 236, 237, 252 Go to the middle: median = **222**

3. Range – Subtract: largest data point (MAX) – smallest data point (MIN)

- **EXAMPLE:** Find the median and the range of the following data set.
  2.6, 6.5, 1.6, 3.4, 8.2, 5.4 [1.2.VQ-1]

  Sort the numbers: 1.6, 2.6, 3.4, 5.4, 6.5, 8.2
  Go to the middle: 3.4 + 5.4 = 8.8 / 2 = **4.4** = median
  MAX – MIN = 8.2 – 1.6 = **6.6** = range

Notes Section 1.2 – Visualizing and Graphing Data

B. Distance between Two Points

Distance Formula: Given two points (x_1, y_1) and (x_2, y_2), the **distance** between them is:

$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

- **EXAMPLE:** Find the distance between the pair of points (10, –21) and (–23, –25). (Round to the nearest thousandth as needed) [1.2.31]

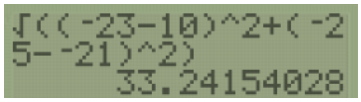
  Use the Distance Formula above:

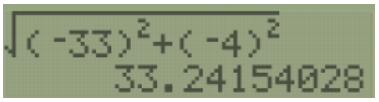
  $d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2} = \sqrt{(-23 - 10)^2 + (-25 - -21)^2}$

  You can enter ALL of this computation in calculator at once, but do so CAREFULLY!!

  Watch the negatives and parentheses.

  You can also work it in smaller chunks: $\sqrt{(-33)^2 + (-4)^2}$

  or
  

  The distance is **33.242**.

C. Midpoint of a segment with known endpoints

Midpoint Formula: Given two points (x_1, y_1) and (x_2, y_2), the **midpoint** of the segment between those two points is:

$$M = \left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right)$$ It's the AVERAGE of each coordinate!

- **EXAMPLE:** Find the midpoint of the line segment joining the two points (–6, –8) and (–3, –7). [1.2-32]

  Use the Midpoint Formula above:

  $$M = \left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right) = \left(\frac{-6 + -3}{2}, \frac{-8 + -7}{2}\right) = \left(-\frac{9}{2}, -\frac{15}{2}\right)$$

Notes Section 1.2 – Visualizing and Graphing Data

D. Applications of Midpoint

- **EXAMPLE:** Use the information given in the table to solve the problem.

The table gives the value of a 1957 Chevy BelAire in #2 condition for selected years.

Year	1980	1982	1984	1986	1988
Value in dollars	8257	8450	9929	10,552	12,554

Use the concept of an average or mean to estimate the value of a 1957 Chevy BelAire in #2 condition in 1983. [1.2-33]

Since 1983 is halfway between, or the average of, 1982 and 1984, we can use the **midpoint** formula

$$M = \left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right) = \left(\frac{1982 + 1984}{2}, \frac{8450 + 9929}{2}\right) = (1983, 9189.50)$$

So, the value of a 1957 Chevy BelAire in #2 condition in 1983 is **$9189.50**.

E. Two-Variable Data

1. Determine the Domain and Range of a relation.

Relation: a set of ordered pairs (points).

Domain: the set of all *x*-coordinates from a relation.

Range: the set of all *y*-coordinates from a relation.

- **EXAMPLE:**

x	4	7	2	7	4
y	5	7	7	5	5

For the table of data, complete the following:

(a) Express the data as a relation S.
(Type ordered pairs. Use a comma to separate answers as needed.)

(b) Find the domain and range of S.
(Use a comma to separate answers as needed.) [1.2.15]

(a) When listing a set of ordered pairs from a table, do NOT include any DUPLICATES.
- So the relation S = { **(4,5),(7,7),(2,7),(7,5)** }

(b) When listing elements of domain or the range, do NOT include any DUPLICATES.
- Domain: { **4,7,2** }
- Range: { **5,7** }

Notes Section 1.2 – Visualizing and Graphing Data

2. Make a scatterplot of a relation

Scatterplot: a graphical representation of a relation. Looks like a group of **points**.

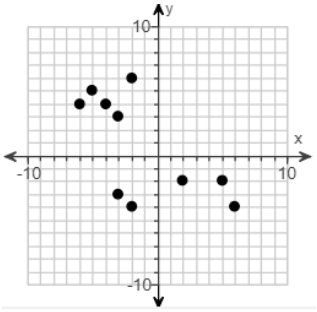
Quadrants: move in order counter-clockwise, starting in upper-right quadrant.

First Quadrant (QI)	Second Quadrant (QII)	Third Quadrant (QIII)	Fourth Quadrant (QIV)
(+,+)	(–,+)	(–,–)	(+,–)

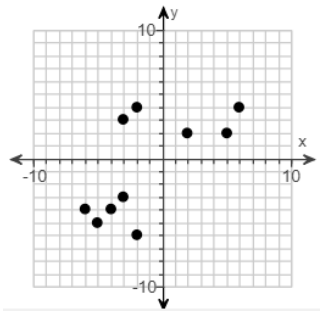
- **EXAMPLE:** Make a scatterplot of the data. [1.2-59]

$\{(2,2), (-6,-4), (-3,-3), (-2,4), (-3,3), (5,2), (-4,-4), (6,4), (-5,-5), (-2,-6)\}$

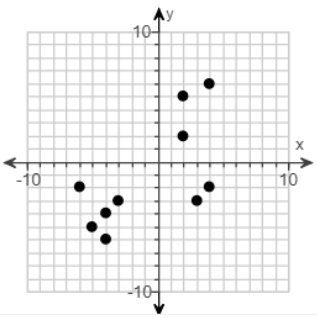
A.



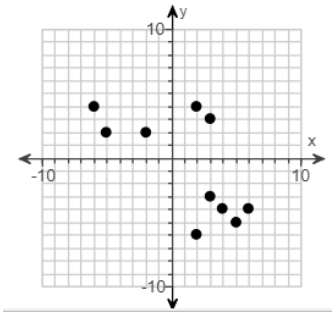
B.



C.



D.



- A good strategy is to start with **Quadrant I**, where both coordinates are **positive**.
  - The points (2,2), (5,2), and (6,4) are all in Quadrant I.
  - Only **scatterplot answer B** has those 3 points in Quadrant 1, so that must be the answer.
- If more than one answer has the same points in Quadrant I, then try another Quadrant, etc.

- To create a SCATTERPLOT on the CALCULATOR (bonus content – time permitting)

1. **First** – you need to enter your points into the calculator. Press **STAT**, **ENTER**. 

If needed – to clear entries in a list, use arrow-up button to the top and then press **CLEAR**, **ENTER**. 

Do NOT press DELETE, or your list will disappear!
Enter the ***x*-coordinates in L1** and the ***y*-coordinates in L2**.
(For the remainder of this process, we will be using the points listed from the previous example.)

2. **Second** – you need to prepare to view the scatterplot. These are like the settings of the Stat Plot.

Press 2ND, Y= (StatPlot), ENTER.
For each row, select the following: Plot1, On, Type: (use 1st one – scatterplot), Xlist: L1, Ylist: L2, Mark: (use 1st one – the circle).

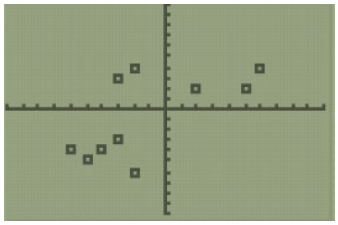
3. **Third** – you need to set the appropriate viewing window. Press **WINDOW**. 

- If the question or answer(s) have a graph, set your viewing window from that info.
- Otherwise, use the given points as your guide.
  - Let's look at the previous problem again. The data points to graph are:

$$\{(2,2),(-6,-4),(-3,-3),(-2,4),(-3,3),(5,2),(-4,-4),(6,4),(-5,-5),(-2,-6)\}$$

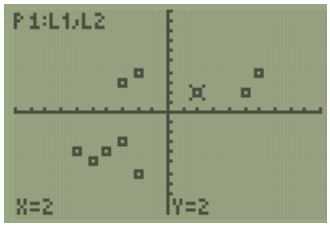
  - Find the **smallest** and **largest *x*-coordinates** and ***y*-coordinates**.
  - Give them a "**buffer**" so that no points occur on the edge of your screen.
  - Smallest *x*-coordinate: –6 Use Xmin = –10
  - Largest *x*-coordinate: 6 Use Xmax = 10
  - Consider **scale**, or distance between "tick" marks for *x* Use Xscl = 1
  - Smallest *y*-coordinate: –6 Use Ymin = –10
  - Largest *y*-coordinate: 4 Use Ymax = 10
  - Consider **scale**, or distance between "tick" marks for *y* Use Yscl = 1

4. **Fourth**, and finally – you can see your graph by pressing **GRAPH**. 



5. **Fifth**, you can confirm you have all the right points by pressing TRACE.

This turns on the "GPS" of a graph, showing you which point the flashing cursor is on.



- The top of the screen reads: " P1: L1,L2" – P1 means we're using Plot1 for this graph, and the L1,L2 means the *x*-coordinates come from L1 and the *y*-coordinates come from L2.
- The bottom of the screen is showing the coordinates of the highlighted point. In the screenshot above, the point (2,2) has an "X" on it. It's a flashing "X" on your calculator.
- Use the right arrow key to navigate through the points and left arrow to go back.

Sources used:

1. Pearson MyMathLab *College Algebra with Modeling and Visualization, 6th Edition*, Rockswold
2. Wabbitemu calculator emulator version 1.9.5.21 by Revolution Software, BootFree ©2006-2014 Ben Moody, Rom8x ©2005-2014 Andree Chea. Website https://archive.codeplex.com/?p=wabbit