

Name: \_\_\_\_\_

**Radicals and Rational numbers**

1) Circle the numbers below that represent IRRATIONAL numbers.

$\frac{5}{9}$

$\frac{5}{\sqrt{9}}$

$\sqrt{.0036}$

$\frac{\pi}{6}$

$0.\overline{94}$

$-5\sqrt[3]{32}$

2) Show that the numbers below are RATIONAL by converting to  $\frac{p}{q}$  where p and q are integers.

a. 0.781

$$\frac{781}{1000}$$

b.  $0.\overline{44}$

$$\begin{aligned} x &= 0.\overline{44} \\ 10x &= 4.\overline{44} \\ 9x &= 4 \\ x &= \frac{4}{9} \end{aligned} \quad \left. \begin{array}{l} \text{Subtract} \end{array} \right\}$$

c.  $4.\overline{6231}$

$$\begin{aligned} x &= 4.\overline{6231} \\ 100x &= 462.\overline{31} \\ 10000x &= 46231.\overline{31} \\ 9900x &= 45769 \\ x &= \frac{45769}{9900} \end{aligned} \quad \left. \begin{array}{l} \text{Subtract} \end{array} \right\}$$

3) Simplify the expressions into their simplest radical form. Show your work. Do not use a calculator.

a.  $-8\sqrt{49}$

$-8 \cdot 7 = -56$

c.  $\sqrt{72}$

$$\sqrt{36 \cdot 2}$$

$6\sqrt{2}$

$$b. \frac{\sqrt{12}}{\sqrt{18}} = \frac{\sqrt{4} \cdot \sqrt{3}}{\sqrt{9} \cdot \sqrt{2}} = \frac{2\sqrt{3}}{3\sqrt{2}}$$

$$d. \sqrt{768} = \sqrt{256 \cdot 3} = 16\sqrt{3}$$

$16\sqrt{3}$

e.  $3\sqrt[3]{16000}$

$$\sqrt[3]{16 \cdot 1000}$$

$3 \cdot \sqrt[3]{16} \cdot \sqrt[3]{1000}$

$3 \cdot 4 \cdot \sqrt[3]{100} \cdot \sqrt[3]{10}$

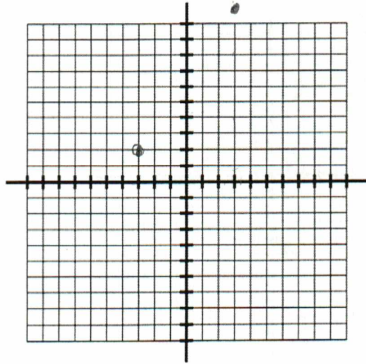
$3 \cdot 4 \cdot 10 \cdot \sqrt[3]{10}$

$120\sqrt[3]{10}$

MATH 1: Accelerated

**Lines, Midpoints and Distances**

4) A line segment  $\overline{AB}$  has endpoints with coordinates  $A(-3,2)$  and  $B(3,11)$ .



a) Calculate the slope of the segment.

$$\frac{11-2}{3-(-3)} = \frac{9}{6} = \frac{3}{2}$$

b) Calculate the midpoint of the segment.

$$\left( \frac{-3+3}{2}, \frac{2+11}{2} \right) \rightarrow \left( 0, \frac{13}{2} \right)$$

c) Calculate the length of the segment.

$$\sqrt{(-3-3)^2 + (2-11)^2} = \sqrt{6^2 + 9^2} = \sqrt{36+81} = \sqrt{117}$$

d) Find a point D that splits the  $\overline{AB}$  into two parts with lengths in a ratio of 1:2

horizontal  $\frac{6}{3} = 2$  vertical  $\frac{9}{3} = 3$

$$(-3+2, 2+3) \rightarrow (-1, 5) \quad \text{or} \quad (3-2, 11-3) \rightarrow (1, 8)$$

5) Write the equation of the line that is parallel to the line  $x = 9$  and passes through the point  $(1, 7)$ .

Vertical line

$$x = 1$$

6) Write the equation of the line that is parallel to  $y = \frac{-1}{3}x + 4$  and passes through the point  $(9, -5)$ .

$$m = \frac{-1}{3}$$

$$y + 5 = \frac{-1}{3}(x - 9)$$

$$y + 5 = \frac{-1}{3}x + 3$$

$$y = \frac{-1}{3}x - 2$$

7) Write the equation of the line that is perpendicular to  $x - 3y = 12$  and passes through point  $(6, 5)$ .

$$-3y = -x + 12$$

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

$$m_{\perp} = -3$$

$$y - 5 = -3(x - 6)$$

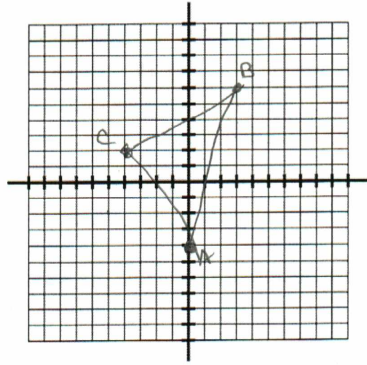
$$y - 5 = -3x + 18$$

$$y = -3x + 23$$

MATH 1: Accelerated

8) In  $\triangle ABC$ ,  $A = (0, -4)$ ,  $B = (3, 6)$ , and  $C = (-4, 2)$ .

a. Graph the points on the grid below.



b. Find the coordinate of midpoint of  $\overline{AC}$ .

$$\left( \frac{0-4}{2}, \frac{-4+2}{2} \right) \rightarrow (-2, -1)$$

c. Write the length of  $\overline{BC}$ .

$$\begin{aligned} &= \sqrt{(3-(-4))^2 + (6-2)^2} \\ &= \sqrt{7^2 + 4^2} \\ &= \sqrt{49 + 16} \\ &= \sqrt{65} \end{aligned}$$

d. Write the equation of the line containing the height of  $\triangle ABC$  from point C to side  $\overline{AB}$ .

$\perp$  to  $\overline{AB}$        $m_{\overline{AB}} = \frac{6-(-4)}{3-0} = \frac{10}{3}$   
 $m_{\perp} = -\frac{3}{10}$

$$y - 2 = -\frac{3}{10}(x + 4)$$

f. Justify that the line segment connecting the midpoints of  $\overline{AC}$  and  $\overline{CB}$  is parallel to side  $\overline{AB}$ .

midpoint  $\overline{AC}$      $(-2, -1)$   
 midpoint  $\overline{CB}$      $\left( \frac{3+(-4)}{2}, \frac{6+2}{2} \right) \rightarrow \left( -\frac{1}{2}, 4 \right)$

Slope between midpoints

$$\frac{-1-4}{-2-(-\frac{1}{2})} = \frac{-5}{-\frac{3}{2}} = 5 \cdot \frac{2}{3} = \frac{10}{3}$$

$$m_{\overline{AB}} = \frac{10}{3}$$

e. Determine if  $\triangle ABC$  is a right triangle. Explain your answer clearly with mathematical justification. A graph is NOT sufficient justification.

$$\begin{aligned} m_{\overline{BC}} &= \frac{6-(-4)}{3-0} = \frac{10}{3} \\ m_{\overline{CA}} &= \frac{2-(-4)}{-4-0} = \frac{6}{-4} = -\frac{3}{2} \\ m_{\overline{CB}} &= \frac{6-2}{3-(-4)} = \frac{4}{7} \end{aligned}$$

$\triangle ABC$  is not a right  $\triangle$  since no set of slopes are opposite reciprocals

**Transformations:**

9) Circle which transformations below are **rigid transformations**. (In other words, circle ALL that will produce an image **congruent to** the preimage):

- a)  Translate the image up 4 units and right 6 units.
- b)  $(x, y) \rightarrow (8x, -y + 2)$  ✗
- c)  $(x, y) \rightarrow (-y, 5x)$  ✗
- d)  $(x, y) \rightarrow (x - 4, 2(y + 3))$  ✗
- e)   $(x, y) \rightarrow (y - 2, x + 1)$
- f)  Rotate 180 degrees about the point (2, 3).

10) Given  $P = (-6, 2)$ , identify the coordinates of the image  $P'$  when the following transformations are performed:

a) $(x, y) \rightarrow (x + 14, x - 9)$ $(-6 + 14, 2 - 9) \rightarrow (8, -7)$	b) $(x, y) \rightarrow (2x, -5y)$ $(2 \cdot -6, -5 \cdot 2) \rightarrow (-12, -10)$
c) $(x, y)$ is rotated 90 degrees. $(-2, -6)$	d) $(x, y)$ is reflected over the $y$ -axis $(-x, y) \rightarrow (6, 2)$
e) $(x, y)$ is rotated 180 degrees. $(6, -2)$	f) $(x, y)$ is reflected over the line $y = -x$ $(-2, 6)$
g) $(x, y)$ is reflected across the line $y = 4$ $(-6, 2) \rightarrow (6, -2) \rightarrow (-6, 2) \rightarrow (-6, 6)$ $(x, y) \rightarrow (x, -y) \rightarrow (7, 4)$	h) $(x, y)$ is rotated 90 degrees about the origin then reflected across $y = x$ $(-2, -6) \rightarrow (-6, -2)$
i) $(x, y) \rightarrow (y - 2, x + 1)$ and then rotated 270 degrees. $(0, -5) \rightarrow (-5, 0)$	j) $(x, y) \rightarrow (y - 2, x + 1)$ and then rotated 270 degrees. ←
k) $(x, y)$ is reflected over the $x$ -axis. $(-6, -2)$	

11) Write a rule for transforming the point  $(x, y)$  under the conditions given below.

- a) Translate right 2 and up 3. Then reflect in the  $x$ -axis.  $(x + 2, y + 3) \rightarrow (x + 2, -y - 3)$
- b) Rotate 90 degrees around the origin and then reflect in the line  $y = -x$ .  $(-y, x) \rightarrow (-x, y)$
- c) Rotate <sup>90°</sup> around the point  $(-4, 5)$ .  $(x, y) \rightarrow (x + 4, y - 5)$  (back to  $(0, 0)$ )  
 $(-y + 5, x + 4)$  rotate 90°  
 $(-y + 5 - 4, x + 4 + 5)$  move back  
 $(-y + 1, x + 9)$
- d) Reflect over the line  $y = -4$ .  
 $(x, y) \rightarrow (x, y + 4)$  move 4  
 $(x, -y - 4)$  reflect over  $x$ -axis  
 $(x, -y - 8)$  move 4

**Quadrilaterals:**

For #12-14, circle the appropriate answers.

- 12) Which TWO statements are true:
- a. All rectangles are always squares.
  - b. All squares are always rhombuses.
  - c. All trapezoids are parallelograms.
  - d. All rectangles are always parallelograms.

13) Choose the best answer:  
If I draw the sides of a figure and consecutively the sides measure 9 inches, 5 inches, 9 inches and 5 inches without any other information you can determine that I've drawn a

- a. Rectangle.
- b. Rhombus.
- c. Parallelogram.
- d. Square.

- 14) A figure with four sides and perpendicular diagonals could be a
- a. Rhombus or square.
  - b. Rectangle or square.
  - c. Trapezoid or rhombus.
  - d. Rectangle or trapezoid.

- 15) A quadrilateral that has diagonals that bisect each other could NOT be a
- a. Rectangle,
  - b. Rhombus.
  - c. Parallelogram. *all could*
  - d. Trapezoid.

Write the appropriate answer in the space provided.

- 16) Identify which quadrilateral has ALL of the properties listed:
- a. Opposite sides are congruent.  
*Parallelogram, Rhombus, Square, Rectangle*
  - b. Opposite sides are parallel

17) Name the quadrilateral that has at least two parallel sides.

*Trapezoid*  
*also □, Rectangle, Square, Rhombus*

18) Name the quadrilateral that has ALL the properties listed below:

- a) Opposite sides are congruent.
- b) Opposite sides are parallel
- c) At least one angle is a right angle.

*Square*

19) Name the quadrilaterals with diagonals that always bisect each other.

*Rhombus*  
*Square*  
*Rectangle*  
*□*

MATH 1: Accelerated

GEOMETRY

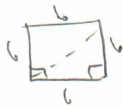
20) Name the quadrilaterals that have perpendicular diagonals.

Square, rhombus, kite

21) Name the quadrilaterals that have congruent diagonals.

Square  
rectangle  
isosceles trapezoid

22) The perimeter of a square is 24. Sketch a figure and then find the length of the diagonal of the square and write it in simplest radical form.



$$\text{diagonal} = 6\sqrt{2}$$

$$6^2 + 6^2 = d^2$$

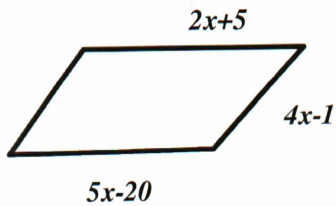
$$72 = d^2$$

$$\sqrt{72} = d$$

$$\sqrt{36 \cdot 2} = d$$

$$d = 6\sqrt{2}$$

23) The opposite sides of a parallelogram are represented by  $2x + 10$  and  $5x - 20$ . Find the length of the side represented by  $4x - 1$ .



$$2x + 8 = 5x - 20$$

$$25 = 3x$$

$$\frac{25}{3} = x$$

$$4\left(\frac{25}{3}\right) - 1$$

$$= \frac{100}{3} - 1$$

$$= \frac{97}{3}$$

MATH 1: Accelerated

24) Given quadrilateral ABCD, write a plan for **how** you would prove the following: [In your description explain that whether you will use slope, midpoints and distances...]

A. How would you prove ABCD is a Rectangle?

Prove  $\square$  (Opp sides are  $\parallel$ )  
then 2 sides  $\perp$ , having  
opposite reciprocal slopes

B. How would you prove ABCD is a Rhombus?

Prove  $\square$  (= slopes)  
Show consecutive sides  $\cong$  (distance)

C. How would you prove ABCD is a Square?

- Show  $\square$  (= slopes)  
- consecutive sides  $\cong$  (distance)  
- 2 sides are  $\perp$  (opposite  
slopes)

D. How would you prove ABCD is an Isosceles Trapezoid?

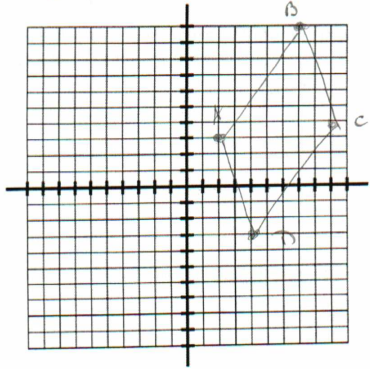
Diagonals are  $\cong$  using distance

E. How would you prove ABCD is a Kite?

Using distance show 2 pairs of adjacent sides are  $\cong$

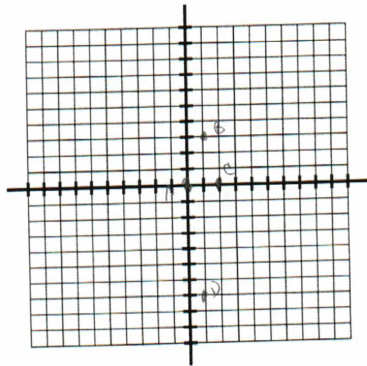
For the following problems you must write a coordinate geometry proof. This means that you must show calculations for slopes, distances, midpoints, etc. and use these calculations/measurements to justify your argument. A DRAWING IS NOT A SUFFICIENT JUSTIFICATION.

25) Justify that the points A(2,3), B(7,10), C(9,4), and D(4,-3) form a parallelogram that is NOT a rectangle.



parallelogram has 2 pairs of sides -  
 use slope formula -  
 $m_{AB} = \frac{10-3}{7-2} = \frac{7}{5}$      $m_{DC} = \frac{-3-4}{4-9} = \frac{-7}{-5} = \frac{7}{5}$   
 $m_{BC} = \frac{4-10}{9-7} = \frac{-6}{2} = -3$      $m_{AD} = \frac{3-(-3)}{2-4} = \frac{6}{-2} = -3$   
 $m_{AB} = m_{DC}$  &  $m_{BC} = m_{AD}$   
 $\therefore \overline{AB} \parallel \overline{DC}$  and  $\overline{BC} \parallel \overline{AD}$   
 $\therefore \square ABCD$  is a parallelogram  
 It is not a rectangle since the slopes are not opposite reciprocals which would make the segments  $\perp$  ( $m_1 \cdot m_2 = -1$ )

26) Given points A(0,0) and B(1,3), find two points C and D so that ABCD is a kite but not a rhombus. Justify your answer with mathematical reasoning.



Kite - C(2,0) D(1,7)  
 a kite is a quadrilateral with  $\perp$  diagonals & 2 pairs of adjacent  $\cong$  sides. A rhombus has  $\perp$  diagonals with all 4 sides  $\cong$ .  
 $m_{BD}$  undefined     $m_{AC} = 0$   
 a horizontal & vertical line are  $\perp$   
 $AB = \sqrt{1^2 + 3^2}$      $BC = \sqrt{1^2 + 3^2}$   
 $\overline{AB} \cong \overline{BC}$  since have same length  
 $AD = \sqrt{1^2 + 7^2}$      $CD = \sqrt{1^2 + 7^2}$

ABCD is a Kite not rhombus



1. Mr. Hagan measured the height, in inches, of all of his male students.

57, 58, 58, 59, 59, 60, 62, 62, 62, 63, 63, 63, 65, 67, 71

$n=15$

(a) Find the following value based on the heights:

Min: 57    Q1: 59    Median: 62    Q3: 63    Max: 71    IQR:  $63 - 59 = 4$

(b) Are there any outliers? Show your work. State whether you found an outlier or not. If yes, indicate which value is the outlier.

$1.5 \cdot IQR = 1.5 \cdot 4 = 6$   
 $1^{st} Q - 1.5 IQR = 59 - 6 = 53$  (no data points smaller than 53)  
 $3^{rd} Q + 1.5 IQR = 63 + 6 = 69$  (71 is outlier)

(c) What is the of the spread upper 75% of the data?

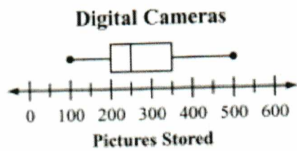
$63 - 71$

(d) Construct a box plot.

Mr. Hagan's test scores



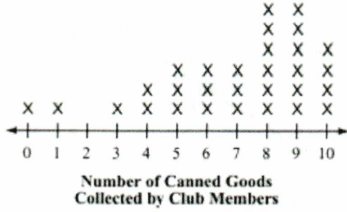
2. The box plot below shows the numbers of pictures that can be stored on different digital cameras



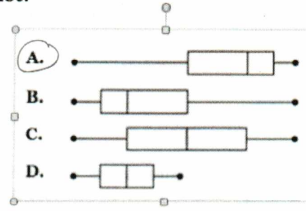
a) What is the median number of pictures that can be stored?

- A. 250
- B. 300
- C. 350
- D. 400

3. The dot plot shows the number of canned goods collected by each member of a club for a food drive.

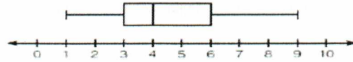


Which of the following box plot correctly represents the data in the dot plot?



4. A movie theater recorded the number of tickets sold daily for a popular movie during the month of June. The box-and-whisker plot shown below represents the data for the number of tickets sold, in hundreds.

Daily Attendance (hundreds of tickets sold)



a) Which conclusion can be made using this box plot?

- A. The median is 600.
- B. The mean of the attendance is 400.
- C. The spread of the attendance is 300 to 600.
- D. Twenty-five percent of the attendance is between 300 and 400.

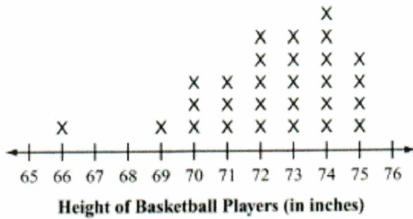
b) What is the best way to describe the shape of the data in the box plot to the left?

- A. Skewed Left
- B. Approximately Symmetrical
- C. Skewed Right
- D. Bimodal

c) The movie theater hired a marketing consultant that reviewed the data for their daily attendance. Here is what he said, "The typical number of tickets sold is 400, but typically varies from 300 to 600 tickets sold on a daily basis." Do you agree or disagree with the consultant? Justify your answer

*Sol. of sale box band 300 & 600 with a median of 400. Since the data is skewed right the median is a good measure of center. Still 25% of tickets are less than 300 & 25% are greater than 600*

5. The dot plot below shows the height of 28 basketball players in inches.



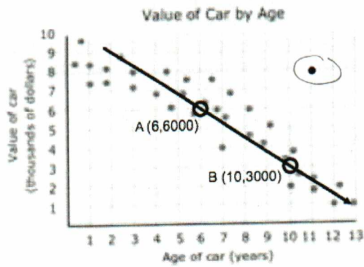
Based on the dot plot, which of the following is true?

- A. The mean is greater than the mode
- B. The median is greater than the mode
- C. The mean is greater than the median
- D. The median is greater than the mean

*$\bar{y} = 72$   
 $med = 73$   
 $mode = 74$*

*skewed*

7. The scatterplot below shows the value (in dollars) of a car vs age (in years).



(a) Describe the trend and correlation in the data in context to the problem. *Negative linear relationship (moderate)*

(b) Circle the outlier in the data, and explain what it means in context to the problem. *The car at 11 years doesn't fit the line.*

(c) Use A and B to find the slope of the line of best fit line. Explain its meaning in the context of the problem.

$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{3000 - 6000}{10 - 6} = \frac{-3000}{4} = -750$$

(d) Find the y-intercept (b) using algebra. Explain its meaning in the context of the problem.

$$y - 6000 = -750(x - 6)$$

$$y - 6000 = -750x + 4500$$

$$y = -750x + 10500$$

*y-intercept is \$10,500 represents the initial value of the car when it was new.*

(e) Write an equation for this situation.

$$y = -750x + 10500$$

(f) Use the equation to predict how old the car will be if it is worth \$500.

$$500 = -750x + 10500$$

$$-10000 = -750x$$

$$x \approx 13\frac{1}{3} \text{ years}$$

8. A survey was conducted to find how many hours students sleep the night before a test. The data is displayed below.

Hours of sleep	# of students
5	3
6	4
7	1
8	2
9	2
10	1

$$n = 10$$

(a) What is the spread of the data?

$$10 - 5 = 5 \rightarrow \text{range}$$

(b) What is mode?

*6 hours of sleep*

(c) What is the median?

*6 hours*

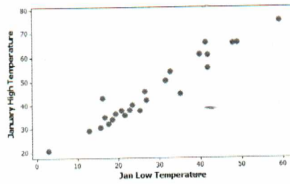
(d) Calculate the mean number of hours.

$$\frac{5 \cdot 3 + 6 \cdot 4 + 7 \cdot 1 + 8 \cdot 2 + 9 \cdot 2 + 10 \cdot 1}{13} = \frac{90}{13}$$

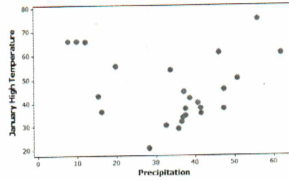
MATH 1: Accelerated

9. Weather data were recorded for a sample of 25 American cities in one year. Variables measured included:
- January high temperature (in degrees Fahrenheit)
  - January low temperature (in degrees Fahrenheit)
  - Annual precipitation (in inches), **and**
  - Annual snow accumulation.

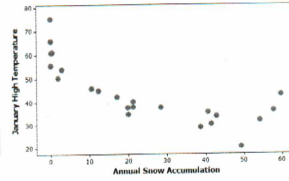
The relationships for three pairs of variables are shown in the graphs below (Jan. Low Temperature—Graph A; Precipitation—Graph B; Annual Snow Accumulation—Graph C).



Graph A



Graph B



Graph C

- a. Which pair of variables will have a correlation coefficient closest to 0 (*circle one*)?
- i. Jan. high temperature and Jan. low temperature (Graph A)
  - ii.** Jan. high temperature and precipitation (Graph B)
  - iii. Jan. high temperature and snow accumulation (Graph C)

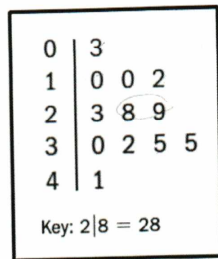
Explain your choice.

- A line can be created that represents the data & allows for predictions to be made.  $r$  correlation -  
 - Graph B is scattered, no correlation (correlation is 0)  
 - Graph C is a linear

- b. Which of the above scatterplots would be best described as a strong nonlinear relationship? Explain your choice.

- Graph C looks quadratic not linear.

10. The stem and leaf plot shows the number of automobiles sold at a dealership each month over one year.



- (a) What is the range of the data?

$41 - 3 = 38$

- (b) What is mode?

10

- (c) What is the median?

$n = 12$

28.5

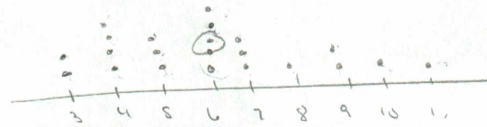
- (d) Calculate the mean number of automobiles.

$\frac{288}{12} = 24$

11. Twenty-two students were surveyed about the number of days they played outside in one month. The results of this survey are shown below.

3, 3, 4, 4, 4, 4, 5, 5, 5, 5, 6, 6, 6, 6, 6, 7, 7, 7, 8, 9, 9, 10, 11

a. On the grid below, create a dot plot based on the data.



b. Identify the typical number of days spent outside by the twenty-five students.

Skewed right  
median = 6

c. Use the statistical features of your calculator to find the standard deviation of the data set (round to the nearest hundredth).

Standard Deviation: 2.21

d. Interpret Standard Deviation in the context of the question.

The standard deviation represents the spread of the data from the  $\bar{x}$ . Approximately 68% of the data fall between 3.71 & 8.21  
( $\bar{x} \pm 1s.d$ )