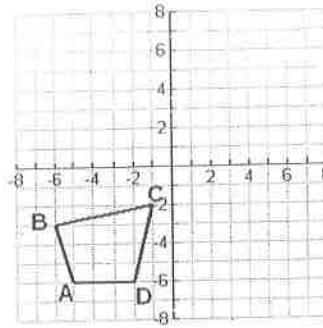Key

Name _____

Use the following figure to answer questions 1-5.

1. If quadrilateral *ABCD* is reflected over the x-axis, the coordinates of D' would be

   A) $(2,-6)$ B) $(-2,6)$ C) $(6,-2)$ D) $(-6,2)$

2. If quadrilateral *ABCD* is reflected over the line $y=x$, the coordinates of C' would be

   A) $(-2,-1)$ B) $(2,1)$ C) $(1,2)$ D) $(1,-2)$

3. If quadrilateral *ABCD* is rotated $270°$ counterclockwise, the coordinates of B' would be

   A) $(-3,-6)$ B) $(3,-6)$ C) $(3,6)$ D) $(-3,6)$

4. If quadrilateral *ABCD* is rotated $180°$ counterclockwise, the coordinates of A' would be

   A) $(6,5)$ B) $(5,6)$ C) $(-5,-6)$ D) $(-6,-5)$

5. If quadrilateral *ABCD* is translated right 5 units and down 2 units, the coordinates of D' would be

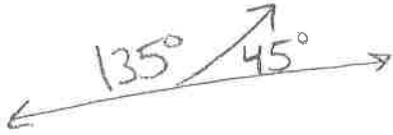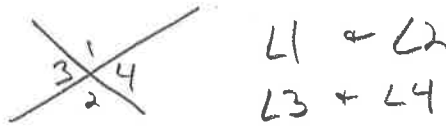   A) $(3,-8)$ B) $(3,-4)$ C) $(-7,-8)$ D) $(-7,-4)$

6. Draw a ray.
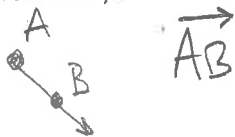
7. Draw an example of an angle bisector.

   $\overrightarrow{ZK}$ is an angle bisector.

8. Draw an example of a linear pair.

$135°$ $45°$

9. Draw an example of vertical angles.

$\angle 1 \cong \angle 2$
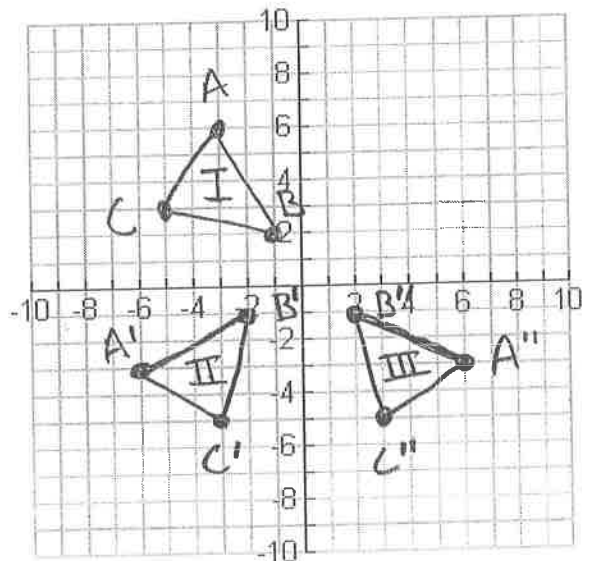$\angle 3 \cong \angle 4$

10. The vertices of Triangle I are $A(-3, 6)$, $B(-1, 2)$ and $C(-5, 3)$. Triangle I is rotated $90°$ counterclockwise, resulting in Triangle II. Triangle II is reflected over the y-axis, resulting in Triangle III.

   A. On the coordinate plane below, **draw** and **label** Triangles I, II and III.

   B. Describe a single transformation that would map Triangle I directly onto Triangle III.

   $(x, y) \rightarrow$ ___(y, x)___
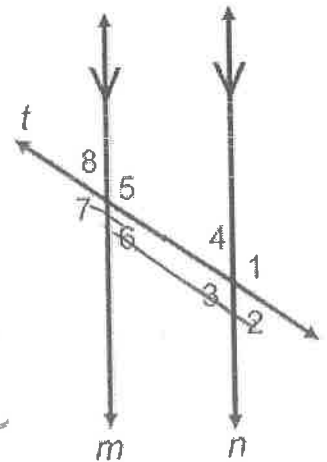
   $A(-3,6)$ $A'(-6,-3)$ $A''(6,-3)$

11. Given: Line m is parallel to line n with transversal t.

   Prove: $m\angle 2 + m\angle 7 = 180°$

Statements	Reasons
1) m‖n, t is transversal	1) Given
2) $m\angle 2 = m\angle 6$	2) Corresponding Angles
3) $m\angle 6 + m\angle 7 = 180°$	3) Linear Pair Postulate
4) $m\angle 2 + m\angle 7 = 180°$	4) Substitution

12. Given: Line m is parallel to line n with transversal t.

Prove: $m\angle 3 = m\angle 5$ (without using Alternate Interior Angles)

S	R
1) $m \parallel n$, t is transversal	1) Given
2) $m\angle 3 = m\angle 7$	2) Corresponding Angles
3) $\angle 7 \cong \angle 5$	3) Vertical Angles Theorem
4) $m\angle 3 \cong m\angle 5$	4) Transitive Property
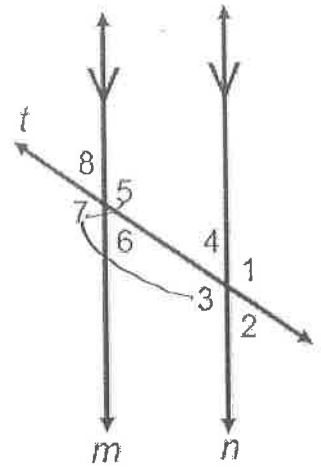
13. Use the given diagram to answer the following question.

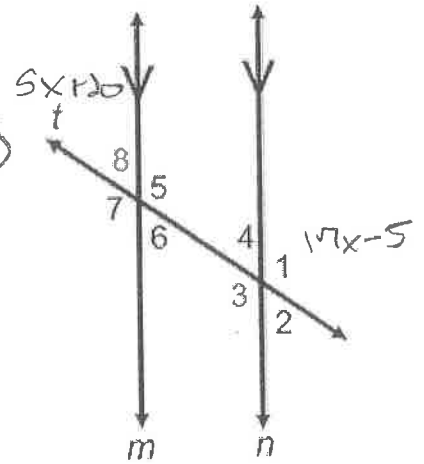If $m \parallel n$, $m\angle 8 = 5x + 20$ and $m\angle 1 = 17x - 5$, find $m\angle 6$.

$5x + 20 + 17x - 5 = 180$ (Same-side exterior)

$22x + 15 = 180$

$x = 7.5$

(vertical) $m\angle 6 = m\angle 8 = 5x + 20$

$m\angle 6 = 5(7.5) + 20$

$= \boxed{57.5°}$

14. Use the given diagram to answer the following question.

If $m \parallel n$, $m\angle 7 = 10x + 7$ and $m\angle 3 = 7x + 44$, find $m\angle 4$.

$10x + 7 = 7x + 44$ (corresponding)

$3x = 37$

$x = 12.3$
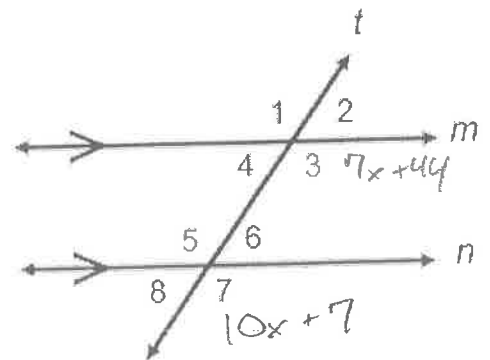
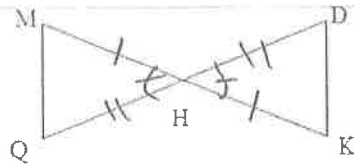$7x + 44 + m\angle 4 = 180$ (Lin pairs)

$7(12.3) + 44 + m\angle 4 = 180$

$130.3 + m\angle 4 = 180$

$m\angle 4 = \boxed{49.6°}$

15. Given: H is the midpoint of $\overline{MK}$ and $\overline{QD}$
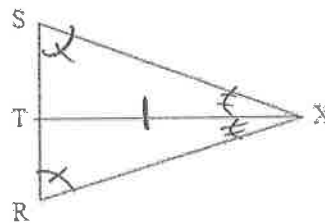
Prove: $\triangle QMH \cong \triangle DKH$

statements	reasons
1) H is midpoint of $\overline{MK}$ & $\overline{QD}$	1) Given
2) $\overline{MH} \cong \overline{HK}$	2) Definition of midpoint
3) $\overline{QH} \cong \overline{HD}$	3) Same ⌐
4) $\angle QHM \cong \angle DHK$	4) Vertical Angles
5) $\triangle QMH \cong \triangle DKH$	5) SAS

16. Given: $\angle S \cong \angle R$ and $\overline{XT}$ bisects $\angle SXR$
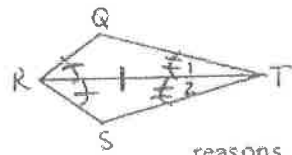
Prove: $\triangle SXT \cong \triangle RXT$

statements	reasons
1) $\angle S \cong \angle R$	1) Given
2) $\overline{XT}$ bisects $\angle SXR$	2) Given
3) $\angle SXT \cong \angle RXT$	3) Definition of bisect
4) $\overline{TX} \cong \overline{TX}$	4) Reflexive Property
5) $\triangle SXT \cong \triangle RXT$	5) AAS

17. Given: $\overline{RT}$ bisects $\angle QRS$, $\angle 1 \cong \angle 2$

Prove: $\triangle RTQ \cong \triangle RTS$

statements	reasons
1) $\overline{RT}$ bisects $\angle QRS$	1) Given
2) $\angle QRT \cong \angle SRT$	2) Definition of bisect
3) $\angle 1 \cong \angle 2$	3) Given
4) $\overline{RT} \cong \overline{RT}$	4) Reflexive Property
5) $\triangle RTQ \cong \triangle RTS$	5) ASA

18. Given: $\overline{AB}\|\overline{DE}$, $\overline{AE}$ bisects $\overline{BD}$
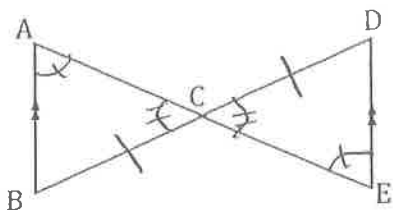
Prove: $\overline{AC}\cong\overline{EC}$

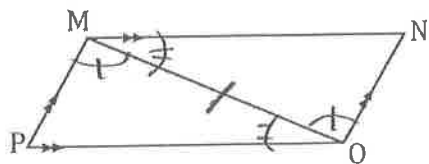| S	R
1) $\overline{AB}\|\overline{DE}$	1) Given
2) $\angle A\cong\angle E$	2) Alternate Interior Angles
3) $\overline{AE}$ bisects $\overline{BD}$	3) Given
4) $\overline{BC}\cong\overline{DC}$	4) Definition of bisect
5) $\angle BCA\cong\angle DCE$	5) Vertical Angles
6) $\triangle BAC\cong\triangle DEC$	6) AAS
7) $\overline{AC}\cong\overline{EC}$	7) CPCTC

19. Given: PM||NO, MN||PO,

Prove: PM≅ON

S	R
1) PM||NO	1) Given
2) $\angle PMO\cong\angle NOM$	2) Alternate Interior Angle
3) $\overline{MN}\|\overline{PO}$	3) Given
4) $\angle NMO\cong\angle POM$	4) Alt. Interior Angles
5) $\overline{MO}\cong\overline{MO}$	5) Reflexive Property
6) $\triangle PMO\cong\triangle NOM$	6) ASA
7) $\overline{PM}\cong\overline{ON}$	7) CPCTC

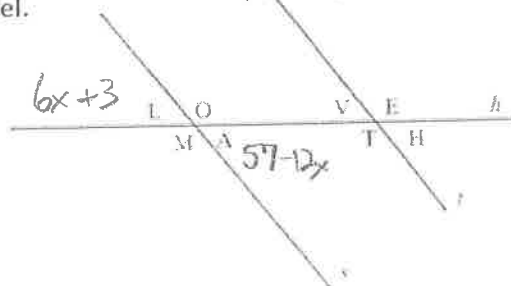**Use the picture on the right for question 20: Lines s and t are parallel.**

20. Angle L = 6x + 3, angle A = 57 – 12x. Solve for x

A) 12   B) 3   C) 10   D) 7.5

$6x+3=57-12x$ (vertical)

$18x=54$

$x=3$

Use the picture on the right for questions 21-24. Lines *m* and *n* are parallel.

21. What is the measure of angle E?

    A) 63°   B) 297°   C) 27°   D) 117°

22. What is the measure of angle H?

    A) 117°   B) 50°   C) 63°   D) 127°

23. How are angle A and angle H related?

    A) Alternate Exterior   B) Interior   C) Corresponding   D) Alternate Interior

24. How are angle G and angle C related?

    A) Alternate Interior   B) Interior   C) Vertical   D) Corresponding

25. Which of the following is an example of an exponential growth function?
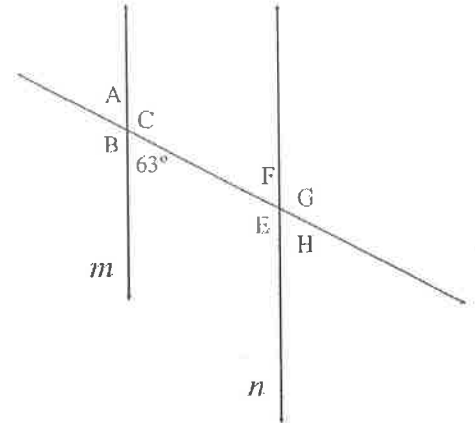
    A) $y = 4(0.1)^x$ B) $y = 4 - x$ C) $y = 4(3)^x$ D) $y = 4x^2$ E) $y = -4x^2$

    # bigger than 1

26. Which of the following is an example of an exponential decay function?
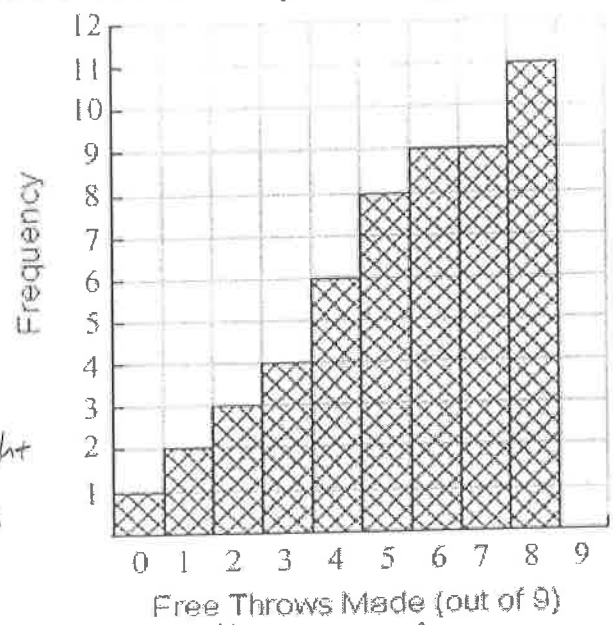
    A) $y = 4(0.1)^x$ B) $y = 4 - x$ C) $y = 4(3)^x$ D) $y = 4x^2$ E) $y = -4x^2$

    # smaller than 1

For questions 27-32, use the histogram to the right that displays how many free throws each student made out of 9 tries in Mr Kain's 3rd period gym class.

27. How many students shot free throws?

A) 9 students

B) 11 students

C) 53 students

D) 58 students

Add heights of bars.

Mr. Kain's 3rd period gym class

Frequency vs Free Throws Made (out of 9)

28. How many total free throws were made?

A) 53 free throws

B) 289 free throws

C) 342 free throws

D) 9 free throws

Multiply the # made by height of that bar then add

29. Calculate the mean number of shots made.

(round to the nearest tenth)

A) 1 free throw made per student   B) 4.5 free throws made per student

C) 5.4 free throws made per student   D) 5.5 free throws made per student

Highlight data in lists

Can use calc: Menu – 4-1-1

or

$$\frac{289 \text{ throws}}{53 \text{ students}}$$

$$5.45 \approx 5.5$$

30. What is the median number of shots made?

A) 5 free throws   B) 6 free throws

C) 6.5 free throws   D) 7 free throws

$$\frac{n+1}{2} = \text{position of median}$$

$$\frac{57+1}{2} = 27^{th} \text{ number}$$

31. If Omar made seven free throws, what is his percentile?

A) 20th Percentile   B) 62nd Percentile

C) 70th Percentile   D) 80th Percentile

$$\frac{42}{53} \rightarrow \text{people who made 7 or less}$$
$$\rightarrow \text{total}$$

$$\approx 0.79 = \text{Approximately the } 80^{th} \text{ percentile.}$$

32. If Karen is at the 40th percentile, this means that:

A) She made 40% of her free throws.   B) 40% of the people scored higher than Karen.

C) 40% of the people scored at or below Karen.   D) 40 People scored less than Karen.

Use the frequency table below for questions 33 - 34.

The following table displays the number of female's that live in the same house.

Number of females that live at home	Frequency
0	4
1	12
2	10
3	8
4	4
5	0
6	2
7	0

$\overline{X}_5$

33. What is the __mean__ number of females that live in the same house?

   (A) 2.1 females   B) 1 female

   C) 1.9 females   D) 2 females

   Put in calc, highlight,

   Men -4-1-1

34. What is the __median__ number of females that live at home?

   A) 2.1 females   B) 1 female

   C) 1.9 females   (D) 2 females)

35. Assume a plant of height 14 cm grows at a constant rate of 8% per day. Write a __recursive__ formula that would give the height of the plant at the end of each day based on the height from the previous day.

   $$\begin{cases} P_0 = 14 \\ P_n = P_{n-1} \cdot 1.08 \end{cases}$$

   $8\% \to 0.08$

36. The population of Gates Mills in 2000 was 2,874. The growth rate is 2.4% per year and a net migration (number of people that leave) of 25 people. Write a __recursive__ formula that would give the population of Gates Mills based on the population from the previous year.

   $$\begin{cases} g_0 = 2,875 \\ g_n = g_{n-1} \cdot 1.024 - 25 \end{cases}$$

The box plots below represent the time spent by students of different grades while traveling to school from home. Use these box plots to answer questions 37-41.

Time Spent in Traveling (minutes)
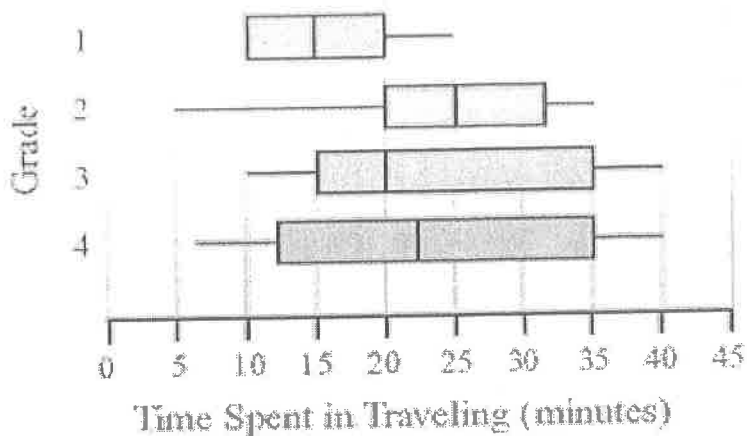
37. Which grade's students had the smallest IQR? $\hookrightarrow Q_3 - Q_1$

A) Grade 1

B) Grade 2

C) Grade 3

D) Grade 4

38. Which grade's distribution is skewed right?

A) Grade 1

B) Grade 2

C) Grade 3

D) Grade 4

39. Which grade's distribution has the largest median?

A) Grade 1

B) Grade 2

C) Grade 3

D) Grade 4

40. If all students start traveling to school at 9:40AM and school starts at 9:45AM, which is the only grade that will have some students reach school on time?

A) Grade 1

B) Grade 2 → only grade who had some people who can make it to school in 5 mins (by 9:45)

C) Grade 3

D) Grade 4

41. For grade 1, what percent of students spend between 10 and 20 minutes traveling?

A) 0%

B) 25%

C) 50%

D) 75%

About 50% of the data is between Q_1 & Q_3 normally, but 75% here since min is same as Q_1.

42. A peculiar giant mythical turtle is found in Vietnam. The turtle currently weighs 20 lbs and its weight increases by 10% every week.

a. Complete the table below.

Week	0	1	2	3	4	5	6
Weight(Lbs)	20	22	24.2	26.6	29.3	32.2	35.4

b. Which of the following scatterplots could be a plot of the (week, weight) data for the first several weeks? **Support your reasoning.**
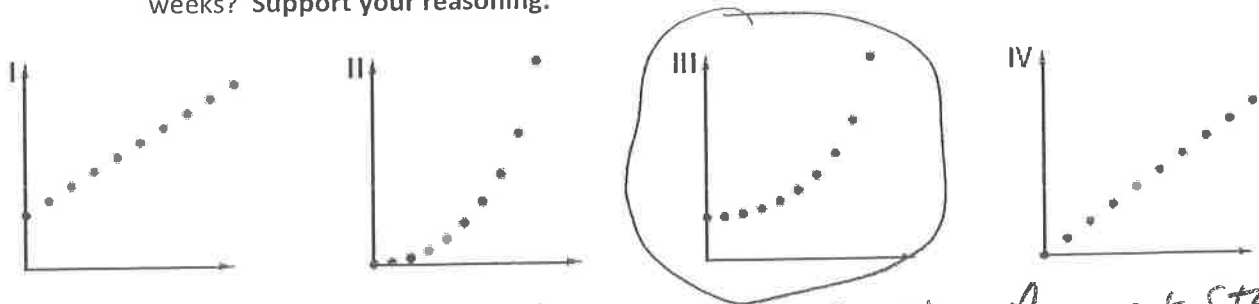
Exponential pattern that does not start at 0.

c. Write a recursive formula that could be used to calculate the weight of the turtle for any week from the weight in the previous week.

$$\begin{cases} t_0 = 20 \\ t_n = t_{n-1} \cdot 1.1 \end{cases} \longrightarrow 110\%$$

d. Write an explicit equation that could be used to calculate the weight of the turtle for any number of weeks x.

$$t(x) = 20(1.1)^x$$

e. What is the weight of the turtle after 20 weeks? **Show your work!!**

$$t(20) = 20(1.1)^{20} \approx \boxed{134.55 \text{ lbs}}$$

lbs = pounds

f. If the giant mythical turtle evolves into a whale when it reaches 1,000 lbs, how many weeks will it take for the turtle found in Vietnam to evolve into a whale?
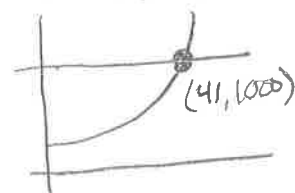
$$1000 = 20(1.1)^x$$

f1   f2
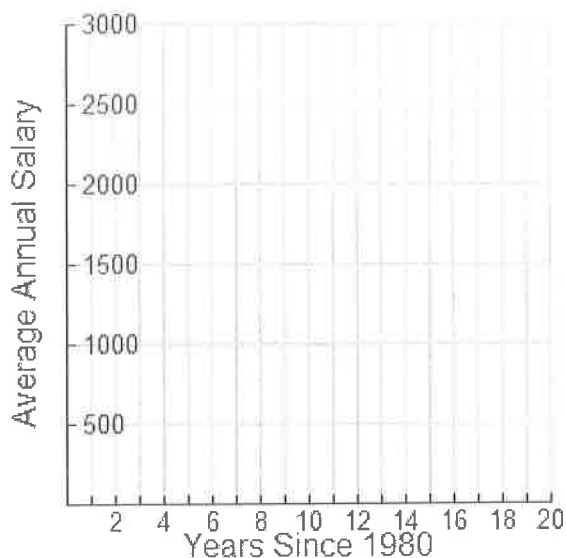
$$\boxed{x = 41 \text{ weeks}}$$

Graph & find intersection in calc. (Menu -6-4)

Window: Ymin :900
Ymax: 1100

(41, 1000)

43. The data below gives the average annual salary for the NBA since the year 1980.

a. Make a scatterplot of this data.

Years Since 1980 (t)	Annual Salary (thousands of dollars) (S)
0	170
5	325
10	750
15	1,900
16	2,000
17	2,200
18	2,600

b. Does the data appear more linear or exponential? Use your calculator to find the appropriate regression equation. Round to the nearest thousandth!

Exponential. The data increases at an increasing rate.

Regression in calc!
Plug in data, then Menu-4-(-A
$f(x) = 161.430(1.169)^x$

c. Use your equation to estimate the average annual salary for an NBA player in the year 2013.
Remember, your answer will be in thousands of dollars!

$f(33) = 161.43(1.169)^{33} \approx 27,916.63$ thousand
or $27,916,630$

$X = 2013 - 1980 = 33$

d. In what year did the average annual salary reach approximately $8 million (represented as 8000 thousands of dollars)?

$8000 = 161.43(1.169)^x$

f1   f2
↳ in calc ↲

Graph & find intersection

$X = 25$ years after 1980

2005

44. Find the equation of the line that is parallel to $y = \frac{3}{4} - \frac{2}{3}x$ and passes through the point (5, 8) in slope intercept form.

Slope-intercept: $y = mx + b$

$M = \frac{2}{3}$

$y - 8 = \frac{2}{3}(x - 5)$

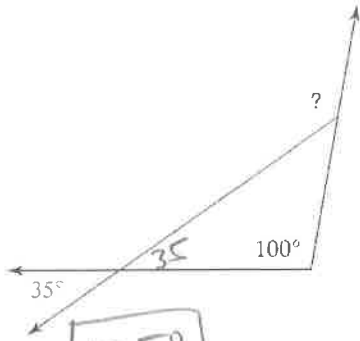$y - 8 = \frac{2}{3}x - \frac{10}{3}$

$y = \frac{2}{3}x + \frac{34}{3}$

45. Find the equation of the line that is perpendicular to $y = 7 - 2x$ and passes through the point (6, -3) in point-slope form.

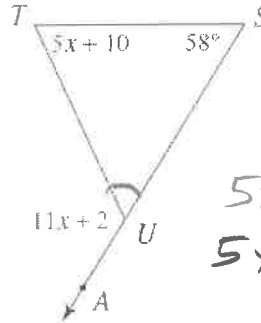point-slope: $y - y_1 = m(x - x_1)$

$M = \frac{1}{2}$

$y + 3 = \frac{1}{2}(x - 6)$

46. Find the measure of the indicated angle.

$100 + 35 = \boxed{135°}$

47. Find the measure of angle TUS.

$5x + 10 + 58 = 11x + 2$

$5x + 68 = 11x + 2$

$66 = 6x$

$x = 11$

$m\angle AUT = 11(11) + 2 = 123°$

$m\angle TUS = 180 - 123 = \boxed{57°}$

48. Could a triangle be formed with the following side lengths?

a. 7, 5, 4

$5 + 4 > 7 \boxed{Yes}$

b. 9, 6, 5

$5 + 6 > 9 \boxed{Yes}$

c. 3, 6, 2

$3 + 2 \not> 6 \boxed{No!}$

49. Two sides of a triangle are given. Find the range of possible measures for the third side.

a. 9, 5,

$9 - 5 = 4$

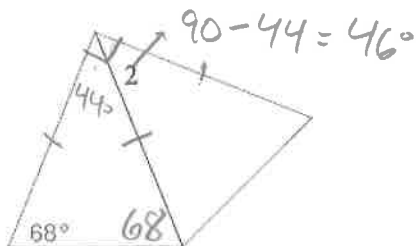$9 + 5 = 14$

$\boxed{\text{Between } 4 + 14 \text{ units}}$

b. 5, 8,

$8 - 5 = 3$

$8 + 5 = 13$

$\boxed{\text{Between } 3 + 13 \text{ units}}$

50. Solve for x.

a. $m\angle 2 = 4x - 2$
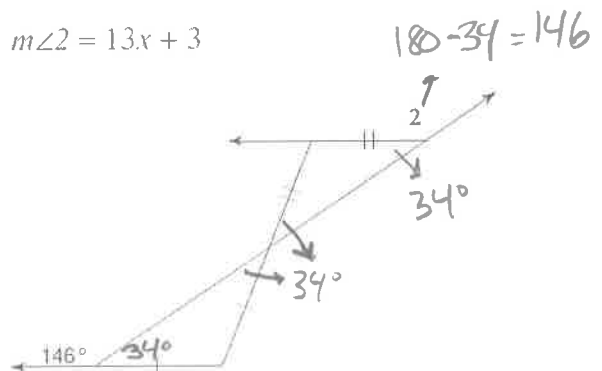

$90 - 44 = 46°$

$180 - 68 - 68 = 44°$

$46 = 4x - 2$

$48 = 4x$

$\boxed{x = 12}$

b. $m\angle 2 = 13x + 3$

$180 - 34 = 146$

$146 = 13x + 3$

$143 = 13x$

$\boxed{x = 11}$

Find the midpoint of the line segments with the given endpoints.

51. (−5, 8) & (3, 10)

$$M = \left(-\frac{5+3}{2}, \frac{8+10}{2}\right) = \boxed{(-1, 9)}$$

52. (−23, −14) & (42, −9)

$$M = \left(\frac{-23+42}{2}, \frac{-14-9}{2}\right) = \boxed{(9.5, -11.5)}$$

Use the information given to find the missing endpoint of the following line segments.

53. Given one endpoint is (7, −2) and the midpoint is (2, 4):

$$(2, 4) = \left(\frac{7+x}{2}, \frac{-2+y}{2}\right)$$

$$2 = \frac{7+x}{2} \qquad 4 = \frac{-2+y}{2}$$

$$4 = 7 + x \qquad 8 = -2 + y$$

$$-3 = x \qquad 10 = y$$

$$\boxed{(-3, 10)}$$

54. Given one endpoint is (−15, −4) and the midpoint is (2.5, −8):

$$2.5 = \frac{-15+x}{2} \qquad -8 = \frac{-4+y}{2}$$

$$5 = -15 + x \qquad -16 = -4 + y$$

$$20 = x \qquad -12 = y$$

$$\boxed{(20, -12)}$$

Find the distance between the following coordinates.

distance

55. (−5, 8) & (3, 10)

$$d^2 = (-5-3)^2 + (8-10)^2$$

$$d^2 = 64 + 4$$

$$\boxed{d = \sqrt{68} \approx 8.25 \text{ units}}$$

56. (−23, −14) & (42, −9)

$$d^2 = (-23-42)^2 + (-14-{}^-9)^2$$

$$d^2 = (-65)^2 + (-5)^2$$

$$d^2 = 4250$$

$$\boxed{d = \sqrt{4250} \approx 65.19 \text{ units}}$$

Use the information given to find the value of z.

57. The distance between (z, 22) and (−11, −50) is 78.

$$78^2 = (z - {}^-11)^2 + (22 - {}^-50)^2$$

$$6084 = (z+11)^2 + (72)^2$$

$$6084 = (z+11)^2 + 5184$$

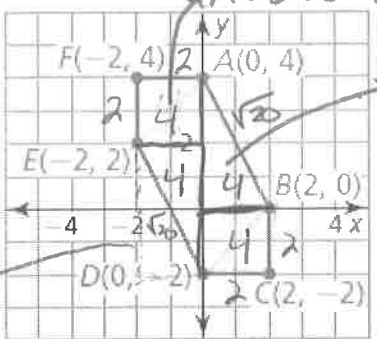$$\sqrt{900} = \sqrt{(z+11)^2}$$

$$\pm 30 = z + 11$$

$$30 = z + 11 \qquad\qquad -30 = z + 11$$

$$\boxed{19 = z} \quad \text{or} \quad \boxed{-41 = z}$$

58. Find the area and perimeter of the figure below. Two ▢ & two △

$A = L \cdot w = 2 \cdot 2 = 4$

$A = \frac{1}{2} b \cdot h = \frac{1}{2} \cdot 2 \cdot 4 = 4$

F(−2, 4) A(0, 4)

E(−2, 2) B(2, 0)

D(0, −2) C(2, −2)

$4^2 + 2^2 = d^2$

$20 = d^2$

$d = \sqrt{20}$

$\text{Area} = 4 + 4 + 4 + 4 = \boxed{16 \text{ units}^2}$

$\text{Perimeter} = 2 + 2 + 2 + 2 + \sqrt{20} + \sqrt{20} \approx \boxed{16.94 \text{ units}}$

59. Prove that the figure **is or is not** a *parallelogram*.
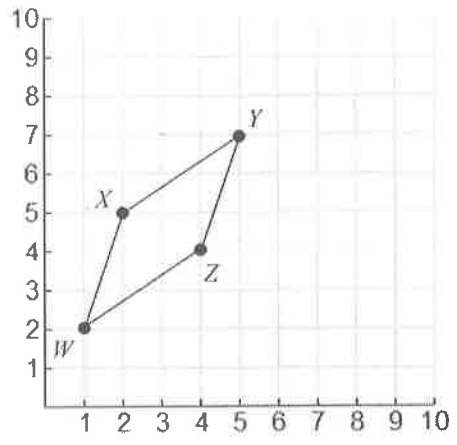
Opposite Sides parallel

Slopes

$\overline{WX} = 3$ } Same = parallel
$\overline{ZY} = 3$

$\overline{XY} = \frac{2}{3}$ } Same = parallel
$\overline{WZ} = \frac{2}{3}$

WXYZ is a parallelogram since the opposite sides are parallel.

60. Prove that the figure ABCD **is or is not** a *rectangle*. $A(0, 0)$ $B(2, 2)$ $C(7, −3)$ $D(5, −5)$

Opposite sides parallel, angles = 90°

Slopes

$\overline{AB} = \frac{2-0}{2-0} = 1$

$\overline{BC} = \frac{-3-2}{7-2} = \frac{-5}{5} = -1$ } Opposite reciprocals = perpendicular

$\overline{CD} = \frac{-5-3}{5-7} = \frac{-2}{-2} = 1$

$\overline{DA} = \frac{0--5}{} = \frac{5}{-5} = -1$

ABCD has opposite sides that are parallel & consecutive sides that are perpendicular, so it is a rectangle.