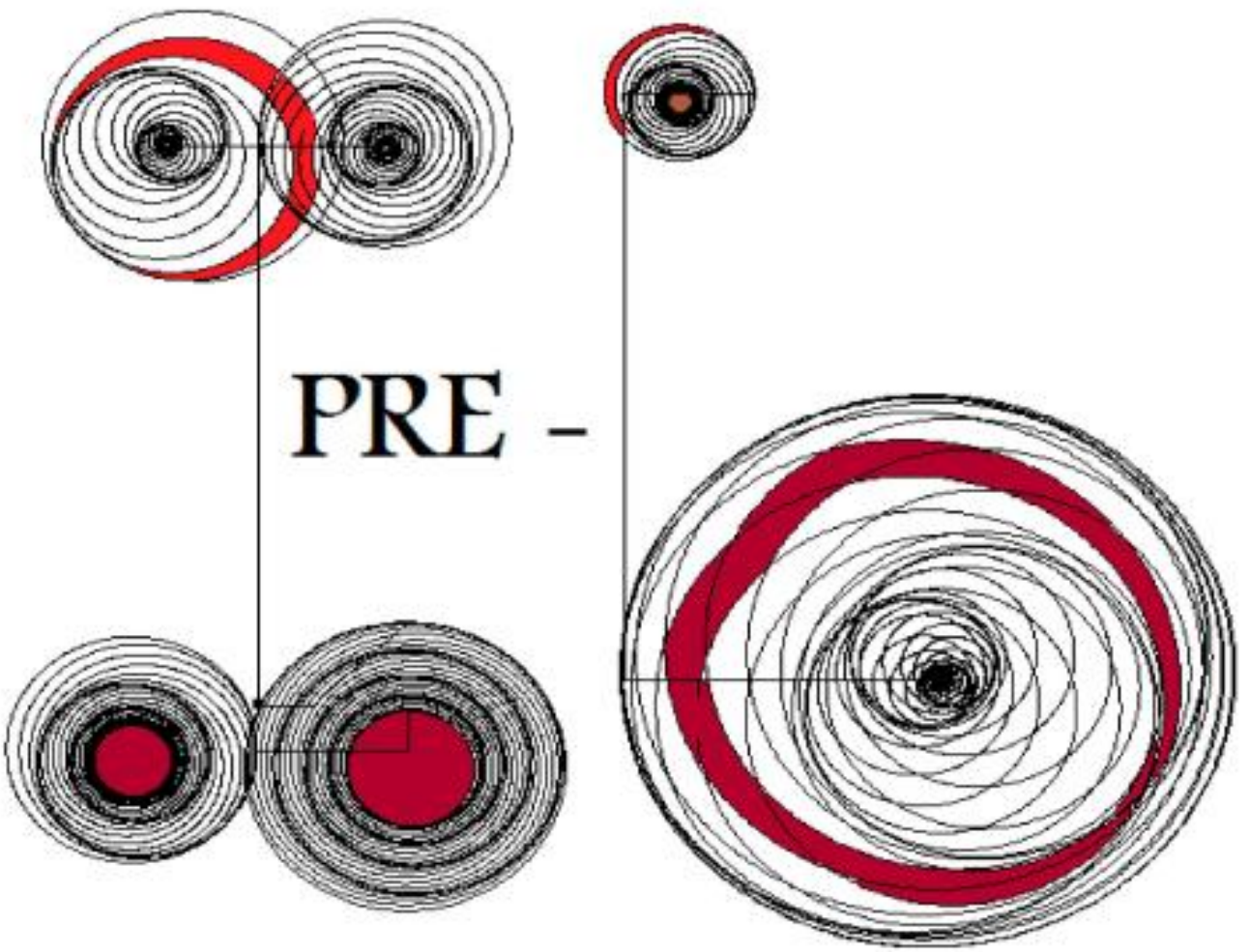
ERAN I. LEVIN

PRE – IB WORKBOOK

FOR FUTURE IB DIPLOMA MATH SL AND HL STUDENTS

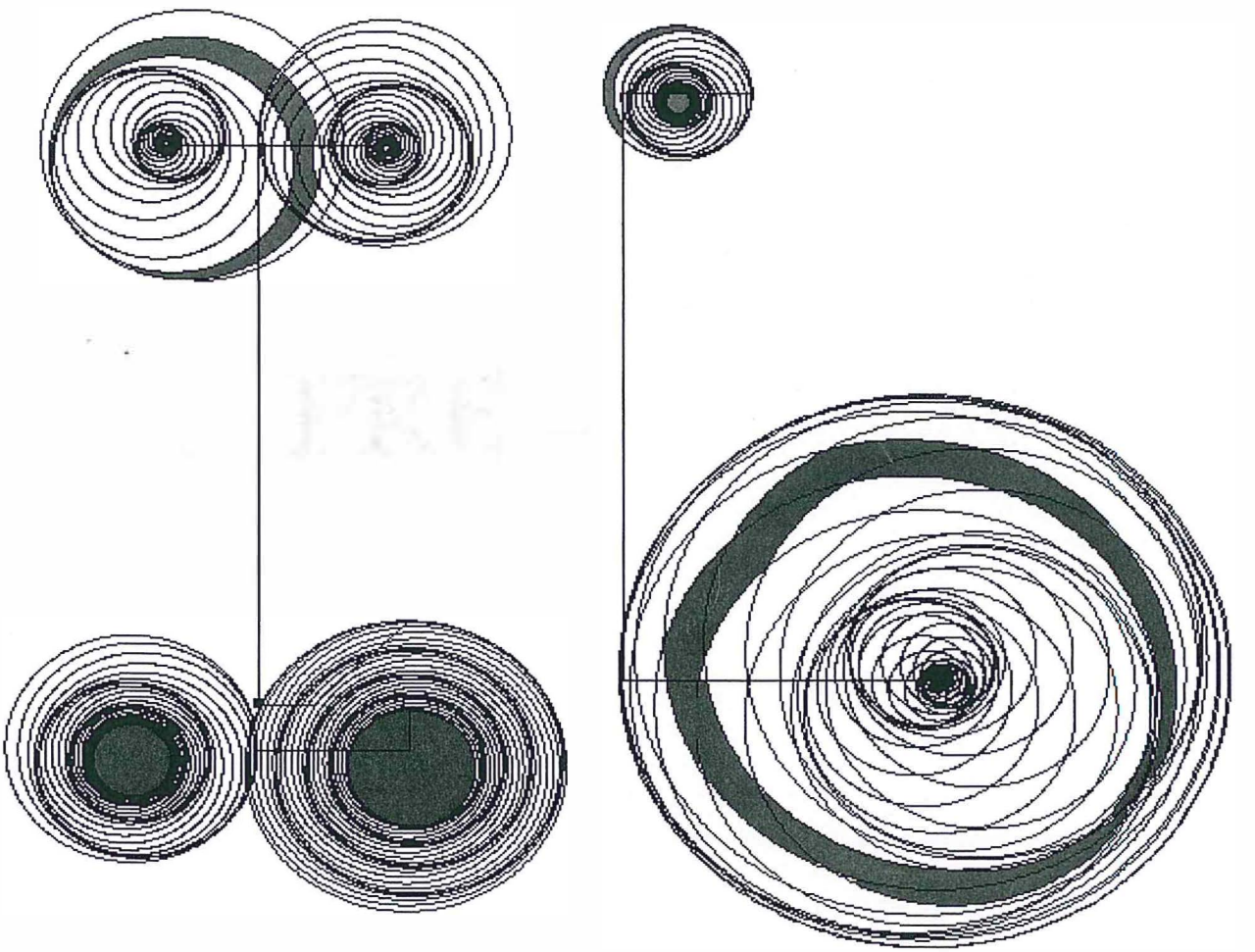


INCLUDES ANSWER KEY

ERAN I. LEVIN

PRE – IB WORKBOOK

FOR FUTURE IB DIPLOMA MATHEMATICS STUDENTS



INCLUDES ANSWER KEY

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ANSWER KEY

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CHAPTER 1

1.1. – ORDER OF OPERATIONS

1. $5+3\cdot 2=$
2. $2\cdot 3-(-3)=$
3. $-5\cdot 5-(-8)\cdot 2=$
4. $-2-5-(-2)+2=$
5. $(-2)(-5)-(-2)\cdot 2=$
6. $25\cdot 2-7=$
7. $15+4/2=$
8. $14/7+3\cdot 6=$
9. $5/5-30/2\cdot 5=$
10. $1+4/2-8/4\cdot 5=$
11. $20/4/2+4=$
12. $12\cdot(2+3)=$
13. $5(3\cdot 2/3\cdot 2)+2=$
14. $1/2+3/2=$
15. $3/5-1/10=$
16. $5(1+3\cdot 2)+2/2-8/4=$
17. $(15+3)\cdot 2-2=$
18. $0/5+3\cdot 2=$
19. $5/0+3\cdot 2=$
20. $(1+1)\cdot(2-2)\cdot(4\cdot 5\cdot 5)=$
21. $(5+3)\cdot 2=$
22. $(5\cdot 3)\cdot 2=$
23. $5\cdot(3\cdot 2)=$
24. $5\cdot 3\cdot 2=$
25. $100/2^2+21/3=$
26. $(2+1)^2/3+13=$
27. $2(3^2-4/2)^2-1\cdot 3=$
28. $3(1-4/2^2)^2-4^2/3=$
29. $10(2^4/2-1^2+1)/2=$
30. $2+3(2-20/2^2)^2-(5^2+3)/2=$

1.2. – DECIMALS AND FRACTIONS

Write as decimals:

1. $\frac{1}{10}=$ $\frac{1}{100}=$ $\frac{1}{1000}=$ $\frac{1}{10000}=$

2. $\frac{2}{10}=$ $\frac{5}{100}=$ $\frac{-31}{1000}=$ $\frac{766}{10000}=$

3. $\frac{55}{10}=$ $\frac{101}{100}=$ $\frac{-335}{1000}=$ $\frac{20000}{10000}=$

Write the decimals as fractions

4. $0.3=$ $0.011=$ $0.312=$ $0.16=$

5. $1.4=$ $2.043=$ $43.3=$ $4.12=$

6. $1.302=$ $1.111=$ $102.32=$ $2.346=$

Perform the operations; give the answer as a decimal and fraction:

7. $50\cdot 0.1=$ $85\cdot 0.01=$ $45\cdot 0.001=$ $6\cdot 0.0001=$

8. $5123\cdot 0.001=$ $435\cdot 0.01=$ $15\cdot 0.001=$ $-236\cdot 0.0001=$

9. $1228\cdot 0.1=$ $1085\cdot 0.01=$ $4500\cdot 0.001=$ $0.16\cdot 0.0001=$

Perform the operations; give the answer as a decimal and fraction:

10. $\frac{1}{0.1}=$ $\frac{5}{0.01}=$ $\frac{-56}{0.001}=$ $\frac{-2.3}{0.01}=$

11. $\frac{3}{0.1}=$ $\frac{0.55}{0.01}=$ $\frac{-31.6}{0.001}=$ $\frac{0.023}{0.01}=$

12. $\frac{15}{0.01}=$ $\frac{-215}{0.01}=$ $\frac{-45.6}{0.001}=$ $\frac{-12.3}{0.01}=$

13. $\frac{1}{0.02}=$ $\frac{-2}{0.03}=$ $\frac{-4.6}{0.05}=$ $\frac{-1.3}{0.06}=$

14. $\frac{1}{0.25}=$ $\frac{-2}{0.9}=$ $\frac{-4.1}{0.2}=$ $\frac{-1.3}{0.05}=$

15. $\frac{1}{0.015}=$ $\frac{-12}{0.6}=$ $\frac{-14}{0.003}=$ $\frac{-0.3}{0.02}=$

16. Write down the number that is 0.21 units on the left of -1:_____

17. Write down the number that is 0.51 units on the left of -2:_____

18. Write down the number that is 0.34 units on the right of -1:_____

19. Write down the number that is 0.06 units on the right of -10:_____

20. Write down the number that is 0.11 units on the right of -1:_____

21. Write down the number that is 0.01 units on the right of -2:_____

22. Write down the number that is 0.34 units on the right of 9:_____

23. Write down the number that is 0.06 units on the right of 10:_____

24. Write down the number that is 0.17 units on the right of -9:_____

25. Write down 2 numbers between 3 and 3.1: _____, _____. Write the same numbers as fractions: _____, _____

26. Write down 2 numbers between 6.2 and 6.3: _____, _____. Write the same numbers as fractions: _____, _____

27. Write down 2 numbers between 6.2 and 6.21: _____, _____. Write the same numbers as fractions: _____, _____

28. Write down 2 numbers between -5.2 and -5.3: _____, _____. Write the same numbers as fractions: _____, _____

29. Write down 2 numbers between 0.25 and 0.251: _____, _____. Write the same numbers as fractions: _____, _____

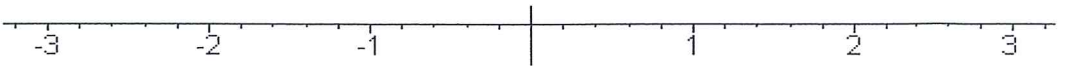
30. Write down 2 numbers between 1.11 and 1.111: _____, _____. Write the same numbers as fractions: _____, _____

31. Write down 2 numbers between 0.21 and 0.22: _____, _____. Write the same numbers as fractions: _____, _____

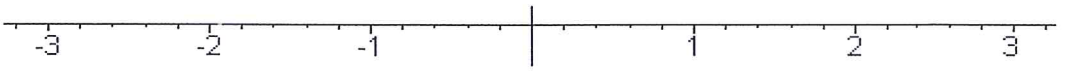
32. Write down 2 numbers between 5.99 and 5.999: _____, _____. Write the same numbers as fractions: _____, _____

33. Write down 2 numbers between 6 and 6.01: _____, _____. Write the same numbers as fractions: _____, _____

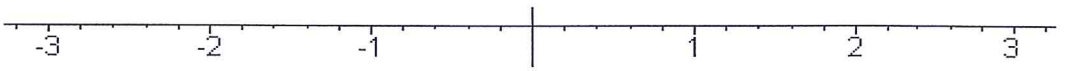
34. Indicate the location of the fractions on the number line: $-\frac{7}{6}, -\frac{6}{7}, \frac{17}{34}, \frac{-1}{7}, \frac{10001}{5000}$



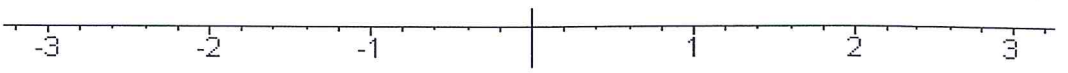
35. Indicate the location of the fractions on the number line: $-\frac{1}{6}, -\frac{8}{7}, \frac{20}{9}, \frac{-10}{20}, \frac{99}{50}$



36. Indicate the location of the fractions on the number line: $-\frac{4}{5}, -\frac{3}{2}, \frac{5}{2}, \frac{9}{8}, \frac{100}{33}$



37. Indicate the location of the fractions on the number line: $-\frac{7}{5}, -\frac{9}{3}, \frac{2}{3}, \frac{1}{10}, -\frac{66}{32}$



Calculate:

38. $1+\frac{2}{3}=$

39. $\frac{5}{6}+\frac{2}{3}=$

40. $\frac{2}{7}-\frac{1}{6}=$

41. $5\cdot\frac{3}{8}-\frac{2}{12}=$

42. $\left(\frac{2}{14}-\frac{3}{7}\right)\cdot\frac{2}{9}=$

43. $\left(\frac{7}{2}-\frac{4}{3}\right)\cdot\frac{1}{5}=$

44. $\frac{5}{6}+\frac{2}{3}=$

45. $\frac{1}{a}+\frac{1}{a}=$

46. $\frac{1}{d}+d=$

47. $\frac{1}{a}+\frac{a}{1}=$

48. $\frac{1}{b+1}+b=$

49. $\frac{a}{b}+\frac{1}{b}=$

50. $\frac{a}{b}+\frac{d}{b}=$

51. $\frac{a}{c}+\frac{d}{b}=$

52. $\frac{a+b}{b}+\frac{d}{b}=$

53. $\dfrac{\left(\dfrac{a}{b}\right)}{b} =$

54. $\dfrac{a}{\left(\dfrac{a}{b}\right)} =$

55. $\dfrac{\left(\dfrac{b}{a}\right)}{b} =$

56. $\dfrac{\left(\dfrac{b}{a}\right)}{1} =$

57. $\dfrac{\left(\dfrac{1}{a}\right)}{b} =$

58. $\dfrac{\left(\dfrac{b}{1}\right)}{b} =$

59. $\dfrac{1}{\left(\dfrac{a}{b}\right)} =$

60. $\dfrac{\left(\dfrac{a}{b}\right)}{\left(\dfrac{a}{b}\right)} =$

61. $\dfrac{\left(\dfrac{b}{a}\right)}{\left(\dfrac{a}{b}\right)} =$

62. $\dfrac{\left(\dfrac{a}{1}\right)}{\left(\dfrac{a}{b}\right)} =$

63. $\dfrac{\left(\dfrac{a}{b}\right)}{\left(\dfrac{1}{b}\right)} =$

64. $\dfrac{\left(\dfrac{c+1}{d}\right)}{\left(\dfrac{1}{d}+d\right)} =$

65. $\dfrac{1}{\left(\dfrac{1}{d}+d\right)} + d =$

66. $\dfrac{1-d}{(d+2)} + \dfrac{2}{d} =$

67. $\dfrac{1}{d} + \dfrac{2}{d^2} + \dfrac{1}{d^3} =$

68. $\dfrac{2}{3} + \dfrac{3a}{c} - \dfrac{b}{2} =$

69. $\dfrac{\left(\dfrac{4}{b} - \dfrac{a}{7}\right)}{2} =$

70. $\dfrac{a}{c(c+1)} + \dfrac{d}{c+1} =$

71. $\dfrac{2x}{\left(\dfrac{2x+2}{3+x}\right)} + \dfrac{\left(\dfrac{x+1}{x-2}\right)}{x-3} =$

72. $\dfrac{\left(2x+\dfrac{1}{x}\right)}{\left(1+\dfrac{1}{x}\right)} =$

73. $\dfrac{12}{2a} \times \dfrac{a+1}{6} =$

74. $\frac{12}{2a} \div \frac{a}{6} =$

75. $3 \times \frac{4}{3} =$

76. $3 \div \frac{4}{3} =$

77. $12 - \frac{4}{3} =$

78. $a \times \frac{b}{3c} =$

79. $\frac{b}{3a} \div 3a =$

80. $\frac{b}{3a} \times 3a =$

81. $\frac{\frac{1}{3} + \frac{2}{5}}{\frac{5}{3} - \frac{1}{3}} =$

1.3. – PERCENTAGES

1. Find (write the expression and simplify it to get a final answer):

   a. 1% of 900 = _____

   b. 2% of 900 = _____

   c. 3% of 900 = _____

   d. 10% of 900 = _____

   e. 15% of 900 = _____

   f. 20% of 900 = _____

   g. 25% of 900 = _____

   h. 35% of 900 = _____

   i. 100% of 900 = _____

   j. 101% of 900 = _____

   k. 110% of 900 = _____

   l. 120% of 900 = _____

   m. 125% of 900 = _____

   n. 140% of 900 = _____

   o. 200% of 900 = _____

   p. 300% of 900 = _____

2. Find (write the expression and simplify it to get a final answer):

   a. 1% of 50 = _____

   b. 2% of 50 = _____

   c. 10% of 70 = _____

   d. 15% of 90 = _____

   e. 20% of 110 = _____

   f. 25% of 350 = _____

   g. 35% of 1100 = _____

   h. 100% of 125 = _____

   i. 101% of 520 = _____

   j. 110% of 130 = _____

   k. 120% of 122 = _____

   l. 125% of 250 = _____

   m. 140% of 9100 = _____

   n. 200% of 240 = _____

   o. 300% of 120 = _____

3. Johann scored 130 out 200 in a test, find his score in percentage?

4. Nina scored 70 out 80 in a test, find her score in percentage?

5. Jeff bought a car for 4000$ and sold it for 5000$, Find his benefit in percent.

6. Jessica bought a car for 4000$ and sold it for 3000$, Find her lost in percent.

7. The price of a shirt is A $.

   a. In case the price increases by 1%, state the new price in terms of A _____

   b. In case the price increases by 2%, state the new price in terms of A _____

   c. In case the price increases by 3%, state the new price in terms of A _____

   d. In case the price increases by 5%, state the new price in terms of A _____

   e. In case the price increases by 8%, state the new price in terms of A _____

   f. In case the price increases by 10%, state the new price in terms of A _____

   g. In case the price increases by 18%, state the new price in terms of A _____

   h. In case the price increases by 30%, state the new price in terms of A _____

   i. In case the price increases by 50%, state the new price in terms of A _____

   j. In case the price increases by 58%, state the new price in terms of A _____

   k. In case the price increases by 90%, state the new price in terms of A _____

   l. In case the price increases by 100%, state the new price in terms of A _____

   m. In case the price increases by 101%, state the new price in terms of A _____

   n. In case the price increases by 108%, state the new price in terms of A _____

   o. In case the price increases by 110%, state the new price in terms of A _____

   p. In case the price increases by 200%, state the new price in terms of A _____

   q. In case the price increases by 228%, state the new price in terms of A _____

   r. In case the price increases by 300%, state the new price in terms of A _____

8. The price of a shirt is A $.

   a. In case the price decreases by 1%, state the new price in terms of A _____

   b. In case the price decreases by 2%, state the new price in terms of A _____

   c. In case the price decreases by 3%, state the new price in terms of A _____

   d. In case the price decreases by 5%, state the new price in terms of A _____

   e. In case the price decreases by 8%, state the new price in terms of A _____

   f. In case the price decreases by 10%, state the new price in terms of A _____

g. In case the price decreases by 18%, state the new price in terms of A _____

h. In case the price decreases by 30%, state the new price in terms of A _____

i. In case the price decreases by 50%, state the new price in terms of A _____

j. In case the price decreases by 58%, state the new price in terms of A _____

k. In case the price decreases by 90%, state the new price in terms of A _____

l. In case the price decreases by 100%, state the new price in terms of A _____

m. In case the price decreases by 101%, state the new price in terms of A _____

n. In case the price decreases by 110%, state the new price in terms of A _____

9. Find 70% of A _____

10. Find x% of M _____

11. To increase an amount by 10% we multiply it by _____

12. To increase an amount by 25% we multiply it by _____

13. To increase an amount by 7.2% we multiply it by _____

14. To decrease an amount by 12% we multiply it by _____

15. To decrease an amount by 35% we multiply it by _____

16. To decrease an amount by 5.1% we multiply it by _____

17. To decrease an amount by 100% we multiply it by _____

18. To increase an amount by 100% we multiply it by _____

19. To increase an amount by 200% we multiply it by _____

20. To increase an amount by M% we multiply it by _____

21. To decrease an amount by S% we multiply it by _____

22. The price of a shirt is B $. In case the price increases by 10% and then decreases by 10% , state the new price in terms of B _____ and the overall change in the price (as a percentage).

23. The price of a shirt is C $. In case the price increases by 20% and then decreases by 30% , state the new price in terms of C _____ and the overall change in the price (as a percentage).

24. The price of a shirt is D $. In case the price decreases by 20% and then increases by 40% , state the new price in terms of D _____ and the overall change in the price (as a percentage).

25. The price of a shirt is E $. In case the price decreases by 30% and then increases by 50% , state the new price in terms of E _____ and the overall change in the price (as a percentage).

26. The price of a shirt is E $. In case the price increases every month by 4%, write the expression for the price after 80 months: _____

27. The price of a shirt is M$. In case the price decreases every month by 12%, write the expression for the price after 10 months: _____

28. The price of a shirt is M$. In case the price decreases every month by 2.5%, write the expression for the price after 10 months: _____

29. The price of a shirt is M$. The price increases by x% every month. State its price in terms of M and x after n months: _____

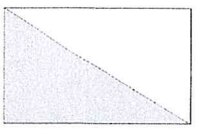
30. The ratio between 2 and 5 is the same as between _____ and a 100.

31. The ratio between 3 and 7 is the same as between _____ and 35.

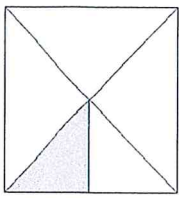
32. The ratio between 2 and 12 is the same as between 6 and _____

33. Given that in a group of 20 students, 3 are taller than 188cm. Write down the percentage of student shorter than 188cm_____

34. Given the rectangle, write down the percentage of it that is shaded: ____



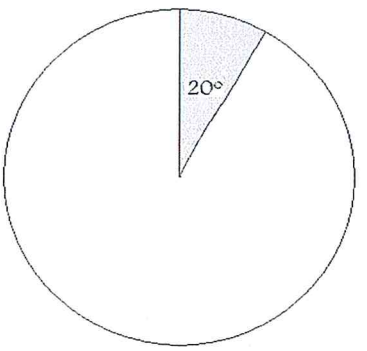
35. Given the following square. Write down the percentage of it that is shaded: _____



36. Given the following circle:

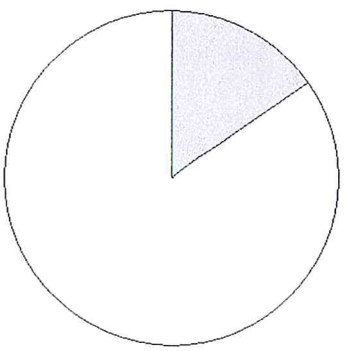
State as a fraction the percentage of the circle that is shaded and the percentage of the circle that is not shaded

Shaded: _____ Not Shaded: _____



37. It is known that the area shaded is 30% of 60% of the circle. Find the percentage of the circle that is shaded and not shaded

Shaded: _____ Not Shaded: _____



38. It is known that 20% of 75% of a class of 40 students are going to the cinema. How many are going?

1.4. – PRIME NUMBERS AND FACTORS GCD AND LCD

1. Write down the prime factors of the following numbers:

   a. 10: _____

   b. 15: _____

   c. 11: _____

   d. 12: _____

   e. 22: _____

   f. 25: _____

   g. 26: _____

   h. 27: _____

   i. 28: _____

   j. 29: _____

   k. 30: _____

   l. 40: _____

   m. 45: _____

   n. 100: _____

   o. 110: _____

   p. 200: _____

   q. 210: _____

   r. 1000: _____

   s. 550: _____

   t. 442: _____

   u. 338: _____

   v. 265: _____

GREATEST COMMON DIVISOR (GCD)

Example: Find the Greatest Common Divisor (GCD) of 120 and 80.

Since $\begin{matrix} 120 = 2^3 \cdot 3 \cdot 5 \\ 80 = 2^4 \cdot 5 \end{matrix}$ their common divisors are $2^3, 5$ so the GCD is $2^3 \cdot 5 = 40$

2. Find the greatest common divisor of 12 and 10.

3. Find the greatest common divisor of 120 and 20.

4. Find the greatest common divisor of 42 and 14.

5. Find the greatest common divisor of 100 and 13.

6. Find the greatest common divisor of 22 and 20.

7. Find the greatest common divisor of 220 and 310.

8. Find the greatest common divisor of 68 and 90.

9. Find the greatest common divisor of 512 and 360.

10. Find the greatest common divisor of 640 and 312.

LEAST COMMON MULTIPLE (LCD)

Example: Find the Greatest Common Divisor (GCD) of 120 and 80.

Since $\begin{matrix} 120 = 2^3 \cdot 3 \cdot 5 \\ 80 = 2^4 \cdot 5 \end{matrix}$ the highest prime factors are $2^4, 3, 5$ so the LCD is $2^4 \cdot 3 \cdot 5 = 240$

11. Find the least common multiple of 12 and 10.

12. Find the least common multiple of 120 and 20.

13. Find the least common multiple of 42 and 14.

14. Find the least common multiple of 100 and 13.

15. Find the least common multiple of 22 and 20.

16. Find the least common multiple of 220 and 310.

17. Find the least common multiple of 68 and 90.

18. Find the least common multiple of 512 and 360.

19. Find the least common multiple of 640 and 312.

1.5. – ROOTS AND RATIONALIZATION

1. Simplify as much as possible:

a. $\sqrt{2}+\sqrt{2}+\sqrt{2}=$

b. $\sqrt{2}+\sqrt{8}+\sqrt{2}=$

c. $\sqrt{4}+\sqrt{2}+\sqrt{8}=$

d. $\sqrt{9}+\sqrt{12}+\sqrt{27}=$

e. $\sqrt{50}+\sqrt{75}+\sqrt{12}=$

f. $\sqrt{3}+\sqrt{75}=$

g. $\sqrt{32}-\sqrt{128}=$

h. $\sqrt{27}+\sqrt{81}+\sqrt{48}=$

i. $\sqrt{200}+\sqrt{50}-\sqrt{18}=$

j. $\sqrt{20}+\sqrt{80}-\sqrt{125}=$

k. $\sqrt{10}\sqrt{10}=$

l. $\sqrt{2}\sqrt{8}=$

m. $\sqrt{3}\sqrt{9}\sqrt{3}=$

n. $\dfrac{\sqrt{200}}{\sqrt{2}}=$

o. $\dfrac{\sqrt{72}}{\sqrt{2}}=$

p. $\dfrac{\sqrt{75}}{\sqrt{5}}=$

q. $\sqrt{3}\dfrac{\sqrt{24}}{\sqrt{2}}=$

2. Rationalize the denominator:

r. $\frac{1}{\sqrt{2}} =$

s. $\frac{3}{\sqrt{5}+1} =$

t. $\frac{-7}{\sqrt{5}-2} =$

u. $\frac{\sqrt{2}+3}{-5} =$

v. $\frac{\sqrt{2}+3}{\sqrt{6}-5} =$

w. $\frac{\sqrt{2}}{\sqrt{6}+\sqrt{3}} =$

x. $\frac{\sqrt{2}-1}{2\sqrt{5}-\sqrt{3}} =$

y. $\frac{-1}{2\sqrt{a}+b} =$

z. $\frac{3\sqrt{a}-2b}{2\sqrt{a}+\sqrt{b}} =$

3. Rationalize the numerator:

a. $\frac{\sqrt{4}}{\sqrt{5}} =$

b. $\frac{3-\sqrt{2}}{\sqrt{5}+1} =$

c. $\frac{-7}{\sqrt{5}-2} =$

d. $\frac{\sqrt{2}+3}{\sqrt{6}-5} =$

e. $\frac{\sqrt{2}}{\sqrt{x}+\sqrt{3}} =$

f. $\frac{\sqrt{b}-a}{2\sqrt{a}-\sqrt{3}} =$

g. $\frac{-3\sqrt{7}+8}{2\sqrt{5}+7} =$

h. $\frac{\sqrt{a}-2\sqrt{b}}{2\sqrt{a}+\sqrt{b}} =$

1.6. – EXPONENTS

Product:

$a^0 =$ __

$a^1 =$ __

$a^2 =$ __ × __

$a^3 =$ _ × _ × _

...

$a^3 a^2 =$ _____ = ___

$a^m a^n =$ _____

Division:

$\frac{a^5}{a^3} =$ ═══ = ═══ = ___

$\frac{a^2}{a^5} =$ ═══ = ═══ = ___

$\frac{a^m}{a^n} =$ _____

Power:

$(a^2)^3 =$ _____ = ___

$\left(\frac{a^2}{b}\right)^3 =$ ═══ = ═══

$(a^m)^n =$ ____

$\left(\frac{a^m}{b^k}\right)^n =$ ═══

Radicals:

$(a^3)^{\frac{1}{2}} =$ ___ = ___

$(a^4)^{\frac{1}{7}} =$ ___ = ___

$(a^m)^{\frac{1}{n}} =$ ___ = ___

Exercises

Write in all possible forms and evaluate without using a calculator (follow example):

1. $4^{-1} = \frac{1}{4} = 0.25$
2. $10^0 =$
3. $10^1 =$
4. $10^3 =$
5. $10^{-1} =$
6. $10^{-2} =$
7. $10^{-3} =$
8. $10^{-4} =$
9. $2^0 =$
10. $2^1 =$
11. $2^{-1} =$
12. $2^{-2} =$
13. $2^{-3} =$
14. $2^{-4} =$
15. $(-1)^0 =$
16. $-1^0 =$
17. $(-1)^1 =$
18. $-1^1 =$
19. $(-1)^{-1} =$
20. $-1^2 =$
21. $(-1)^2 =$
22. $-1^2 =$
23. $(-1)^{-2} =$
24. $-1^{-2} =$
25. $(-3)^0 =$
26. $(-3)^1 =$
27. $-3^1 =$
28. $(-3)^2 =$
29. $-3^2 =$
30. $(-3)^{-1} =$
31. $-3^{-1} =$
32. $(-3)^{-2} =$
33. $-3^{-2} =$
34. $9^{\frac{1}{2}} =$
35. $16^{\frac{3}{4}} =$
36. $(3^{-1})^2 =$
37. $(-8^{-3})^{\frac{2}{3}} =$
38. $\left(\frac{1}{2}\right)^0 =$
39. $\left(\frac{1}{2}\right)^1 =$

40. $\left(\frac{1}{2}\right)^{-1} =$

41. $\left(\frac{1}{2}\right)^{2} =$

42. $\left(\frac{1}{2}\right)^{-2} =$

43. $\left(\frac{3}{5}\right)^{0} =$

44. $\left(\frac{3}{4}\right)^{1} =$

45. $\left(\frac{2}{5}\right)^{-1} =$

46. $\left(\frac{5}{11}\right)^{2} =$

47. $\left(\frac{a}{b}\right)^{-1} =$

48. $\left(\frac{1}{b}\right)^{-1} =$

49. $b^{-1} =$

50. $\left(\frac{-11}{2}\right)^{-2} =$

51. $\left(\frac{3}{-2}\right)^{1} =$

52. $\left(\frac{-12}{\sqrt{2}}\right)^{-1} =$

53. $\left(\frac{5\sqrt{2}}{11}\right)^{2} =$

54. $\left(\frac{-2\sqrt{5}}{2}\right)^{-2} =$

55. $\left(\frac{3+5\sqrt{2}}{-2}\right)^{2} =$

56. $\left(\frac{-12}{2-\sqrt{2}}\right)^{-2} =$

57. $\left(\frac{5+\sqrt{2}}{11}\right)^{2} =$

58. $\left(\frac{-2-\sqrt{5}}{2+\sqrt{2}}\right)^{-2} =$

59. $\left(\frac{-27}{8}\right)^{\frac{2}{3}} =$

60. $\left(\frac{16}{9}\right)^{\frac{3}{4}} =$

61. $5^{27}5^{-29} =$

62. $4^{27}2^{-49} =$

63. $9^{12}3^{-20} =$

64. $(-125)^{\frac{2}{3}} =$

65. $\frac{5^{10}}{5^{2}} =$

66. $\frac{3^{10}}{9^{2}}3^{-2} =$

67. $\left(\frac{2}{5}\right)^{3} \times \left(\frac{5}{3}\right)^{3} =$

68. $\left(\frac{4}{7}\right)^{2} \div \left(\frac{9}{7}\right)^{2} =$

69. $\left(\frac{2}{5}\right)^{3} \cdot \left(\frac{3}{5}\right)^{-4} =$

70. $\left(\frac{3}{4}\right)^{5} \div \left(\frac{9}{64}\right)^{2} =$

71. $\left(\frac{7}{5}\right)^{7} \div \left(\frac{49}{125}\right)^{3} =$

72. $\left(\frac{2^{-3}}{3^{-2}}\right)^{3} \cdot \left(\frac{4}{27}\right)^{2} =$

73. $\left(\frac{4^{2}}{5^{-1}}\right)^{3} \cdot \left(\frac{25^{-1}}{64}\right)^{2} =$

74. $\left(\frac{3^{-5}}{4^{2}}\right)^{2} \div \left(\frac{9^{-2}}{2^{3}}\right)^{3} =$

75. $\left(\frac{5^{4}}{7^{-3}}\right)^{2} \div \left(\frac{25^{-1}}{49}\right)^{-3} =$

76. $2^{-1} + 2 =$

77. $3^{-1} - 3^{-2} =$

78. $5^{-1} - 5^{-2} =$

79. $3^{-3} + 2^{-2} =$

80. $3^{-2} + 4^{-2} =$

81. $7^{-2} + 2^{-2} =$

82. $8^{-2} - 3^{-2} =$

83. $7^{-2} - 2^{-3} =$

84. $a^{-1} + a^{-1} =$

85. $ba^{-1} + a^{-1} =$

86. $2x^{-1} + x^{-2} =$

87. $a^{-1} - ba^{-1} =$

88. $(ba)^{-1} + a^{-1} =$

89. $\frac{1}{x} + x^{-2} =$

90. $ba^{-1} + (ba)^{-1} =$

91. $\frac{3^{-2}}{9^{\frac{2}{3}}} 27^{\frac{5}{4}} =$

92. $\frac{4^{-4}\sqrt{2}}{8^{-\frac{2}{3}}} 16^{\frac{3}{4}} =$

93. $\sqrt{5}\frac{25^2 5^{-1}}{25^{\frac{4}{3}}} 5^{\frac{1}{4}}\sqrt[3]{5} =$

94. $\frac{4^{-2}2^{-4}}{16^2(\sqrt[6]{16^4})} 8^{\frac{1}{4}} 2^{-1} =$

95. $x\sqrt{x}\sqrt{3} =$

96. $x\sqrt{x} + \sqrt{2x} =$

97. $\frac{1}{x\sqrt{x}} =$

98. $\frac{x\sqrt[3]{x}}{\sqrt{x}} =$

99. $s^n s^{2n} s^2 =$

100. $a^{2k} b a^3 b^{2k} a =$

101. $\frac{3^n}{9^n} 27^n =$

102. $\frac{2^n}{8^{n+1}} 16^{n-2} =$

103. $\frac{5^{-n}}{125^{2n-2}} 5^{-n+2} =$

104. $\frac{x^{-n}}{x^{2n-2}} x^{-n+5} =$

105. $\frac{2x^{-n+1}}{2^2 x^{3n+2}} x^{n+5} =$

106. $\frac{2yx^{-2n+3}}{2^5 y^{-1} x^{-4n+2}} x^{-2n+1} =$

107. $\frac{4^2 y^2 x^{-3} z}{2^2 x z^2 y^{-1} x} x^{-2} z^2 =$

108. $\frac{4^2 y^2 (x^{-2} z^2)^{-2}}{(2^2 x)^3 z^2 y^{-1} x} x^{-2} z^2 =$

109. $\frac{4^{-2} y^3 (x^{-2} z^3)^{-1}}{(2^{-3} x)^{-3} z^{-2} y^{-1} x} x z^2 =$

110. $\left(\frac{a}{b^2}\right)^2 \div \left(\frac{a^{-1}}{b^3}\right)^{-3} \cdot \left(\frac{1}{b}\right)^3 =$

111. $\left(\frac{ab}{b^2}\right)^{-2} \div \left(\frac{(2ba)^{-1}}{b^3}\right)^{-3} \cdot \left(\frac{2}{b}\right)^3 =$

112. $\frac{a^{-2}b^n(a^{-2n}b^3)^{-1}}{(b^{-3n}a)^3\sqrt{a}b^{-1}} =$

113. $\frac{a^{-2}b^n(a^{-2n}b^2)^n}{(b^{-3n}a)^n a^{-2n}b^n} =$

114. $\frac{3^n a^{-2}b^n(a^{-2n}b^3)^{n+1}}{(9^n b^{-2n}a)^n a^{-2n}b^{n+2}} =$

115. $\frac{3^n + 3^{n+1}}{3^{n-1}} =$

116. $\frac{4^n + 4^{n-1}}{2^{n-2}} =$

117. $\frac{7^{2n} + 7^{2n-1}}{7^{2n-2}} =$

118. $\frac{7^{3n-1} - 7^{3n}}{7^{2n-2}} =$

1.7. – ABSOLUTE VALUE

1. $|-3| =$ $|3| =$ $|-3+3| =$ $|-3-3| =$

2. $|-3|+3 =$ $|3|-4 =$ $|-3+5|+2 =$ $|-3-3|-3 =$

3. $|1-3+|-2|| =$

4. $|-2-3|+|-2| =$

5. $|-2-23|-|-12| =$

6. $2|1-3+|-2|+1|-2 =$

7. $|-2-3||-2| =$

8. $-|-12-3|-|-2-1| =$

9. $5-|12-3+|1-2||-|-12-10|+1 =$

10. $|2-|-12-3|-|-2-1|| =$

11. $|x|-2|x| =$

12. $|x||x| =$

13. An absolute value of a number represents its _____

14. $|x| = |-x|$ True / False, if false write down an example to show it

15. $|x+y| = |x|+|y|$ True / False, if false write down an example to show it

16. $-|x|$ is _____ number

17. If $x = |x|$ it means x is _____

18. If $x = -|x|$ it means x is _____

19. If x is a negative number than $-x = |x|$ True / False

20. If x is a positive number than $x = |x|$ True / False

1.8. – EXPANDING AND FACTORING

Expand:

1. $(x+1)^2 =$
2. $(x-1)^2 =$
3. $(x+2)^2 =$
4. $(x-2)^2 =$
5. $(a+b)^2 =$
6. $(a-b)^2 =$
7. $(2a+b)^2 =$
8. $(a-3b)^2 =$
9. $(2x+3)^2 =$
10. $(4-x)^2 =$
11. $(x+2)(x-3) =$
12. $(x-2)(x+2) =$
13. $(3+x)(x-7) =$
14. $(2x+2)(x-5) =$
15. $(3x-1)(x+2) =$
16. $(x+4)(x-4) =$
17. $(x+6)(x-6) =$
18. $(x-a)(x+a) =$
19. $(a-b)(a+b) =$
20. $(2x-3c)(2x+3c) =$
21. $x(x+8)^2 =$

22. $(x-6)3x=$

23. $2-(x+1)^2=$

24. $(x+3)^2-(x+2)^2=$

25. $(x-2)^2+(x+2)^2=$

Given the following polynomials, if possible factor, otherwise complete the saquare:

26. $x^2-6x+9=$

27. $x^2-5x+6=$

28. $x^2+4x+10=$

29. $-x^2-x+6=$

30. $x^2+x-6=$

31. $x^2+5x+6=$

32. $-x^2+7x-10=$

33. $x^2-6x+12=$

34. $x^2+3x+2=$

35. $x^2-x-2=$

36. $-x^2+4x=$

37. $-x^2+4x-10=$

38. $x^2+x-2=$

39. $x^2+3x+7=$

40. $x^2-3x+2=$

41. $x^2-x+7=$

42. $x^2+5x+9=$

43. $-x^2-5x+6=$

44. $x^2-2xa+a^2=$

45. $x^2-a^2=$

46. $c^2-a^2=$

47. $x^2-x=$

48. $2x^2-x=$

49. $2x^2 + 3x =$

50. $x^2 + 5x =$

51. $x^2 - 7x + 12 =$

52. $2x^2 - 4x =$

53. $x^2 - 7x + 10 =$

54. $x^2 - 7x + 6 =$

55. $x^2 - x - 12 =$

56. $x^2 + x - 12 =$

57. $x^2 - 3x - 10 =$

58. $x^2 - 8x - 9 =$

Obtain the maximum possible common factor:

59. $x - ax =$

60. $3x - x - ax =$

61. $-x + ax =$

62. $xy + 2x =$

63. $8xy - 2y =$

64. $-6x + 12xy =$

65. $12xyz + 2xy =$

66. $14xy - 2yz =$

67. $12xz + 14xyz =$

68. $xy + 4y^2 + 5y =$

69. $z - 4z^2 + 8zy =$

70. $-8x^3 - 4xyz =$

71. $-6x^4 + x^2y^2 + x^2 =$

72. $-9x^7y^3 + 3x^3y =$

73. $-90x^{10}y^5 - 3x^3y^4 =$

74. $-80x^4y^6z^8 + 8x^{12}y^4z^6 =$

75. $xyz + 2x^2y^2z^2 + 3x^3y^3z^3 =$

76. $10x^3y^2z^4 + 2x^2y^6z^4 - 5x^2y^4z^2 =$

77. $20x^{30}y^{20}z^{40} - 2x^{20}y^{60}z^{40} - 2x^{20}y^{40}z^{20} =$

78. $ax^m + x^m =$

79. $ax^m - x =$

80. $-ax^m - x^{2m} =$

81. $z^{n+1} - z^{n+2} =$

Factor and simplify:

82. $\dfrac{x^2-6x+9}{x^2-7x+12} =$

83. $\dfrac{x^2-5x+6}{x^2+x-6} =$

84. $\dfrac{x^2-9}{x^2-7x+12} =$

85. $\dfrac{x^2-1}{x^2-2x+1} =$

86. $\dfrac{x^2-6x+8}{x^2-4x+4} =$

87. $\dfrac{x^2-16}{x^2+5x+4} =$

88. $\dfrac{x^2-x-2}{x^2+6x+5} =$

89. $\dfrac{3x+9}{x^2-9} =$

90. $\dfrac{x^2-6x}{x^2-7x+6} =$

91. $\dfrac{x^2-x}{x^2+x-2} =$

92. $\dfrac{x^2-4}{x^2+x-2} =$

93. $\dfrac{4-x}{x-4} =$

94. $\dfrac{x^2-x}{1-x}=$

95. $\dfrac{2x-1}{4x^2-4x+1}=$

96. $\dfrac{x^2-2x}{x^2-4}=$

97. $\dfrac{4x^2+4x+1}{2x^2+5x+2}=$

98. $\dfrac{3x^2+4x+1}{9x^2-1}=$

99. $\dfrac{4x^2+4x-3}{2x^2-13x+15}=$

100. $\dfrac{4x^2+4x-3}{2x^2-13x+15}=\dfrac{(2x+3)(2x-1)}{(2x-3)(x-5)}$

101. $\dfrac{5x^2-12x+4}{10x^2+16x-8}=$

1.9. – REARRANGING FORMULAE

Solve for x:

1. $\frac{x}{12}=5$

2. $\frac{x}{7}+2=5$

3. $\frac{2x}{7}+2=5-3x$

4. $\frac{2x}{7}+\frac{2}{5}=-2x+1$

5. $\frac{2x-1}{x}=3$

6. $\frac{x+2}{2x}=5$

7. $\frac{x-2}{2x-1}=6$

8. $\frac{2x-2}{x+1}=-2$

9. $\frac{2x}{7}+1=\frac{-5x}{7}$

10. $\frac{2x}{7}+4=\frac{3x}{2}$

11. $\frac{2}{x}-3=\frac{3}{2x}$

12. $\frac{2}{x-2}-3=\frac{3}{x-2}$

13. $\frac{-2}{x}=\frac{3}{x-2}$

14. $\frac{4}{x+1}=\frac{4}{x+2}$

15. $\frac{2}{x+1}=\frac{4}{x+2}$

16. $-\frac{2}{2x+1}-2=\frac{4}{2x+1}$

17. $xa=b$

18. $x+a=b$

19. $2x+a=b$

20. $2xa=b$

21. $\frac{x}{a}=b$

22. $\frac{a}{x}=b$

23. $2x+ax=b$

24. $x+ax=b$

25. $\frac{x}{2}+a=b$

26. $\frac{x}{a+c}=b$

27. $\dfrac{a}{x-c}=b$

28. $\dfrac{x-d}{a+c}=b$

29. $\dfrac{a+2d}{x-c}=b$

30. $\dfrac{x}{2}+ax=b$

31. $\dfrac{x}{x+c}=b$

32. $\dfrac{x-a}{x+c}=b$

33. $1-x=b$

34. $\dfrac{1}{x}-s=b$

35. $\dfrac{1-x}{a}=b$

36. $\dfrac{1-x}{x}=b$

37. $\dfrac{1}{a}+\dfrac{1}{x}=b$

38. $\dfrac{4}{x}=\dfrac{a}{x+6}$

39. $\frac{14}{x+2} = \frac{a}{x+2} - a$

40. $\frac{2}{x+3} - a = \frac{a+b}{x+3}$

41. $\frac{5}{2x+1} - 3a = \frac{b}{2x+1}$

42. $\frac{-2x}{a+3} = \frac{x+2}{2a-1}$

43. $\frac{-5x+1}{2a} = \frac{bx}{3a+2}$

44. $\frac{a}{x+2} = \frac{b}{x+2} - b + 1$

45. $\frac{b}{2x-4} - 3 = \frac{b}{2x-4} - b + 1$

46. $\frac{1}{ax+2} = \frac{b}{x+a}$

47. $\frac{1}{ax+2} = \frac{b}{ax+2} - 3$

48. $3\frac{x}{ax+2} = 3$

49. $-3\frac{2x}{ax+3} = b$

50. $\frac{2x-3}{2ax+5} = -3b$

1.10. – EVALUATING EXPRESSIONS

Evaluate the expression given the value of x:

1. $x=3,\ x^2+x=$

2. $x=-3,\ x^2+x=$

3. $x=-2,\ 2x^2+3x=$

4. $x=-2,\ x^{-1}=$

5. $x=-2,\ x^3=$

6. $x=-3,\ x^{-3}=$

7. $x=-9,\ 2x^{-2}=$

8. $x=4,\ x^{-2}+x=$

9. $x=-2,\ 2x^2+\frac{x}{2}=$

10. $x=-2,\ \frac{1}{x}+\frac{x}{2}=$

11. $x=4,\ \frac{1}{x-3}+\frac{x}{2}=$

12. $x=10,\ \frac{10}{x-5}+\frac{x-2}{2}=$

13. $x=-1,\ 5x^{-3}+2x^{-1}+1=$

14. $x=3,\ x^{-2}+x+x^2=$

15. $x=2,\ x^{-3}+x^{-2}+x^{-1}+x^0=$

16. $x=2,\ 2x^{-2}\cdot x^{-1}=$

17. $x=-1,\ x^{-200}-2x^{501}=$

18. $x=-5,\ 5x^{-2}-x^2=$

19. $x=-2,\ 2^x=$

20. $x=-2,\ 3^x=$

21. $x=-2,\ 2^{2x+1}=$

22. $x=-1,\ 2^{3x-1}=$

1.11. – SYSTEMS OF EQUATIONS

1. $\begin{cases} 5x+1=2y \\ 4y+x-3=0 \end{cases}$

2. $\begin{cases} 5x+3y=2-2y \\ -y+2x-5=0 \end{cases}$

3. $\begin{cases} 5x=2y \\ -y+2x=0 \end{cases}$

4. $\begin{cases} x=2y-7 \\ 4y-2x=0 \end{cases}$

5. $\begin{cases} -5x+1=2y \\ -4y+x-3=x \end{cases}$

6. $\begin{cases} 5x+1=\frac{1}{2}y \\ 10y-25x=10 \end{cases}$

7. $\begin{cases} \frac{x}{2}+1=2y \\ -\frac{y}{3}+4x+2=0 \end{cases}$

8. $\begin{cases} x=\frac{2}{3}y \\ -y+x-\frac{1}{4}=0 \end{cases}$

9. $\begin{cases} x=\frac{1}{2}-y \\ -y+\frac{x}{5}-5=0 \end{cases}$

10. $\begin{cases} \frac{1}{3}x=1-\frac{3}{2}y \\ -\frac{2}{3}y+\frac{1}{9}x-5=0 \end{cases}$

11. $\begin{cases} 3x+y/2=8 \\ 6x+y=16 \end{cases}$

12. $\begin{cases} 3x+y/2=8 \\ 6x+y=2 \end{cases}$

1.12. – INTERVAL NOTATION AND INEQUALITIES

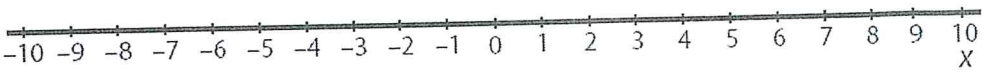
$x \ni (a, b]$ or $\{x|\ a < x \leq b\}$ means x is between a and b, not including a and including b.

Exercises:

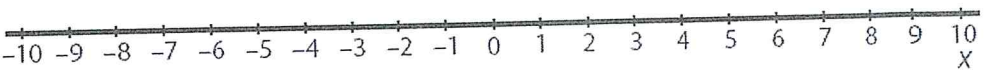
1. Represent the following Intervals on the real line:

a. $x \in (2, 5]$

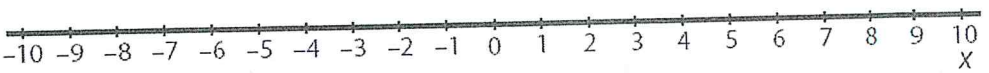
b. $x \in (3,6)$



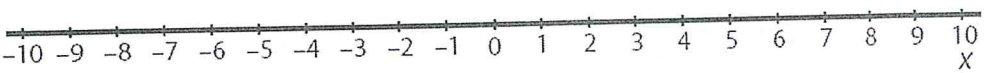
c. $x \in [-5,9]$



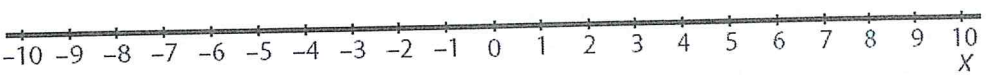
d. $x \in [-8,-1)$



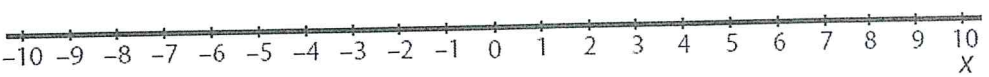
e. $x \in [-\infty,-1)$



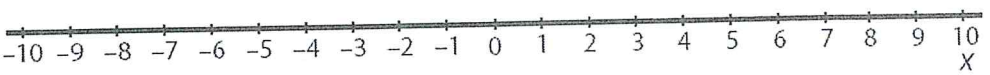
f. $x \in [-\infty,6]$



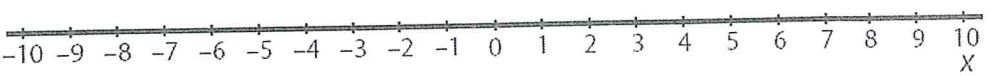
g. $x \in (6, \infty]$



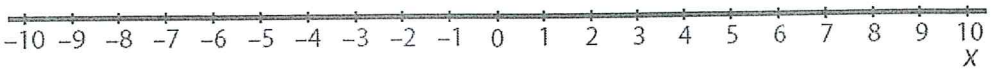
h. $\{x|\ 7 < x < 9\}$



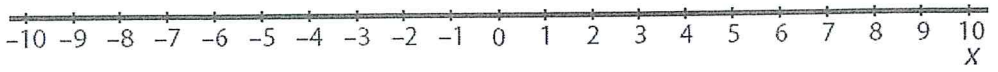
i. $\{x|\ -7 < x < -2\}$



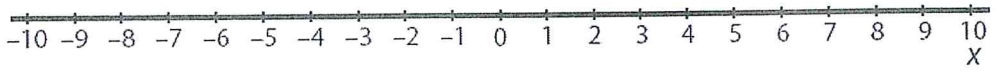
j. $\{x|\ 1 < x < 2\}$



k. $\{x|\ \infty < x < 2\}$

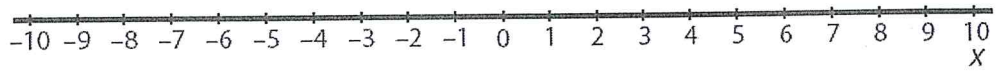


l. $\{x|\ 1 < x < \infty\}$

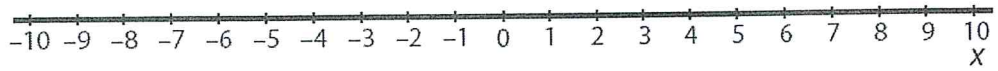


2. Write each one of the Intervals using all types of notations:

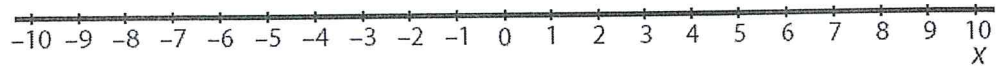
a. $x \in (4, 5)$



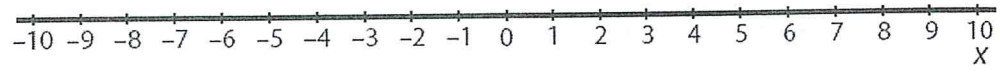
b. $x \in (-\infty, 5)$



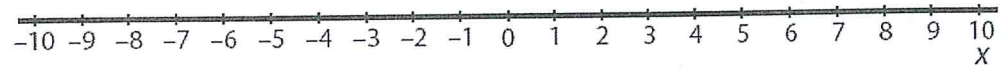
c. $x \in (4, 5)$



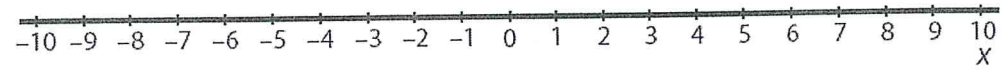
d. $x \in (3, \infty]$



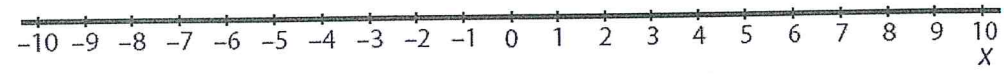
e. $x \in]-5,9]$



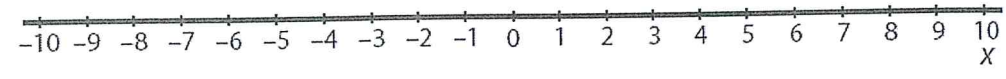
f. $x \in [-8,-1[$



g. $\{x|\ 7 < x < 9\}$



h. $\{x|\ -7 < x < -2\}$



3.

a. Solve the inequality $2x \leq 2$

b. Solve the inequality $-x < -2$.

c. Represent both solutions on the real line:

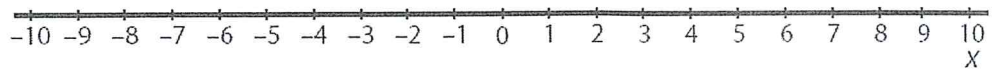
d. State their intersection: _____.

4.

a. Solve the inequality $2x - 2 \leq 2$

b. Solve the inequality $-3x + 1 > -2$.

c. Represent both solutions on the real line:



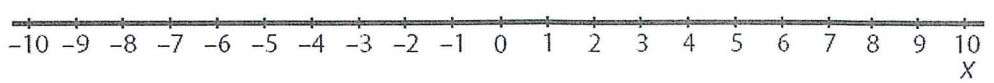
d. State their intersection: _____.

5.

a. Solve the inequality $x - 2 \leq -5$

b. Solve the inequality $-2x + 14 \leq -2$.

c. Represent both solutions on the real line:



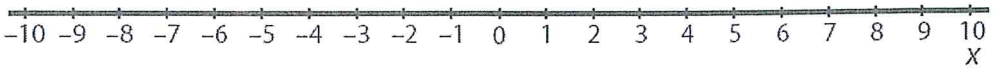
d. State their intersection: _____

6.

e. Solve the inequality $3x - 7 \leq 2$

f. Solve the inequality $-x < -2$.

g. Represent both solutions on the real line:



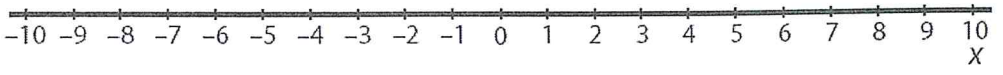
h. State their intersection: _____.

7.

e. Solve the inequality $5x - 2 \leq 2$

f. Solve the inequality $-2x + 1 > -2$.

g. Represent both solutions on the real line:



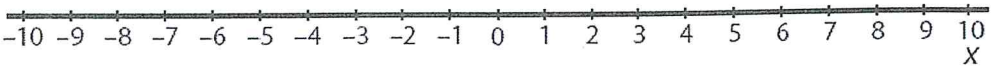
h. State their intersection: _____.

8.

e. Solve the inequality $5x - 2 \leq -12$

f. Solve the inequality $-2x - 3 \leq -2$.

g. Represent both solutions on the real line:



h. State their intersection: _____

1.13. – QUADRATIC EQUATIONS

a. Solve the following equations using the "complete the square method".
b. Check your answers using the quadratic formula.
c. Write the factorized equation.

1. $x^2 - 4x + 1 = 3$

2. $x^2 - 4x + 1 = -3$

3. $x^2 - 4x + 1 = -13$

4. $x^2 + 6x + 2 = 2$

5. $x^2 + 6x + 2 = -10$

6. $x^2 - 3x - 5 = 3$

7. $x^2 - 3x - 3 = -3$

8. $x^2 - 3x - 4 = -1$

9. $x^2 - 7x - 5 = 3$

10. $x^2 + x - 3 = 2$

11. $x^2 - 2x + 4 = 5$

12. $x^2 + 3x - 1 = 3$

13. $x^2 + 7x - 3 = 2$

14. $x^2 + 12x - 4 = -1$

15. $x^2 + x - 2 = -1$

QUADRATIC INEQUALITIES

Solve the following inequalities:

1. $x^2 > 0$

2. $x^2 \geq 0$

3. $x^2 < 0$

4. $x^2 \leq 0$

5. $x^2 - 1 > 0$

6. $x^2 - 1 \geq 0$

7. $x^2 - 1 < 0$

8. $x^2 - 1 \leq 0$

9. $x^2 + 2 > 0$

10. $x^2 + 2 \geq 0$

11. $x^2 + 2 < 0$

12. $x^2 + 2 \leq 0$

13. $x^2 - 3x > 0$

14. $x^2 + 4x \geq 0$

15. $x^2 - 5x < 0$

16. $x^2 + 6x \leq 0$

17. $x^2 - 3x + 2 > 0$

18. $-x^2 + x + 2 > 0$

19. $-x^2 - 6 < 0$

20. $-x^2 + 7 \leq 0$

21. $x^2 - 8x + 12 > 0$

22. $-x^2 + 3x + 3 \leq 0$

23. $-x^2 - 9x > 0$

24. $-x^2 - 3x + 10 > 0$

CHAPTER 2

2.1. – TYPES OF NUMBERS

Natural Numbers (N): $N = \{\_, \_, \_, \_, \_ \ldots\}$

Integers (Z): $Z = \{\ldots, \_, \_, \_, \_, \_, 0, \_, \_, \_, \_, \_ \ldots\}$

Rational Numbers (Q): $Q = \{\frac{a}{b}, a, b \in Z\}$

Numbers that **can** be written as _____being both the numerator and the denominator_____.

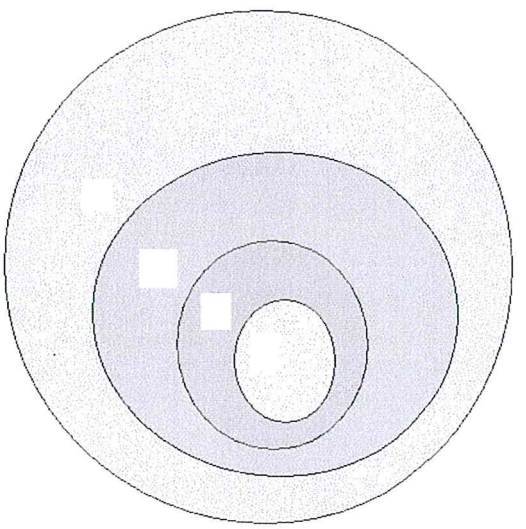
Examples: $\frac{1}{1}, \frac{2}{3}, \frac{-7}{3}, \frac{4}{-1}, \frac{\_\_}{\_\_}, \_\_\_\_\_, \_\_\_\_\_ \ldots$

Irrational Numbers (Q'): $Q' \neq \{\frac{a}{b}, a, b \in Z\}$ Numbers that _____ be written as fractions, being both the _____ and _____ Integers.

Examples: $\_, \_, \_ \ldots$

Real Numbers (R): $R = Q + Q'$ (Rationals and Irrationals)

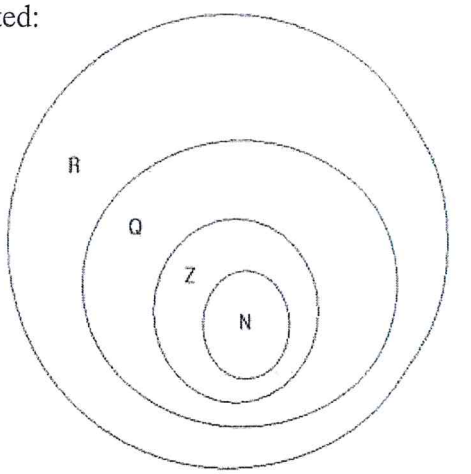
Represented in a Venn diagram:



Exercises

1. Natural numbers are contained in the _____ numbers.
2. Integer numbers are contained in the _____ numbers
3. Rational numbers are contained in the _____ numbers.
4. Irrational numbers are located _____.

5. Shade the area in which the irrational numbers are located:



6. True or False:

   a. All Natural numbers are Integers: ____

   b. All Real numbers are Natural: ____

   c. All Rational numbers are Real: ____

   d. All Real numbers are Rational: ____

   e. All Integer numbers are Rational: ____

   f. All Real numbers are Irrational: ____

   g. Some Irrational numbers are Real and some are not: ____

   h. Some Irrational numbers are Integers: ____

   i. Some integers are negative: ____

   j. Some Irrationals are negative: ____

   k. Some Natural numbers are negative: ____

7. Fill the chart with yes or no (follow the example):

Number	Natural	Integer	Rational	Real
-2	no	yes	yes	yes
π				
$-3.121212\ldots.$				
-15.16				
$\sqrt{3}$				
$-2\frac{2}{5}$				
$\sqrt[3]{8}$				

8. Fill the numbers column with appropriate numbers and yes or no. Follow the example.

Number	Natural	Integer	Rational	Real
	no	yes		
		no	yes	yes
	yes	yes	yes	
			no	yes
		no	yes	yes
			yes	
	no			
		yes	no	

4. Convert the following numbers into the form: $\frac{n}{m}$

a. 0.333... =

b. 1.111... =

c. 5.3 =

d. 5.2828... =

e. –2.3535... =

f. 42.67 =

g. 12.355355... =

h. –31.44 =

i. $0.125125\ldots =$

m. $1.123123\ldots =$

j. $3.22332233\ldots =$

n. $1.22565656\ldots =$

k. $1115.36 =$

o. $1.5696969\ldots =$

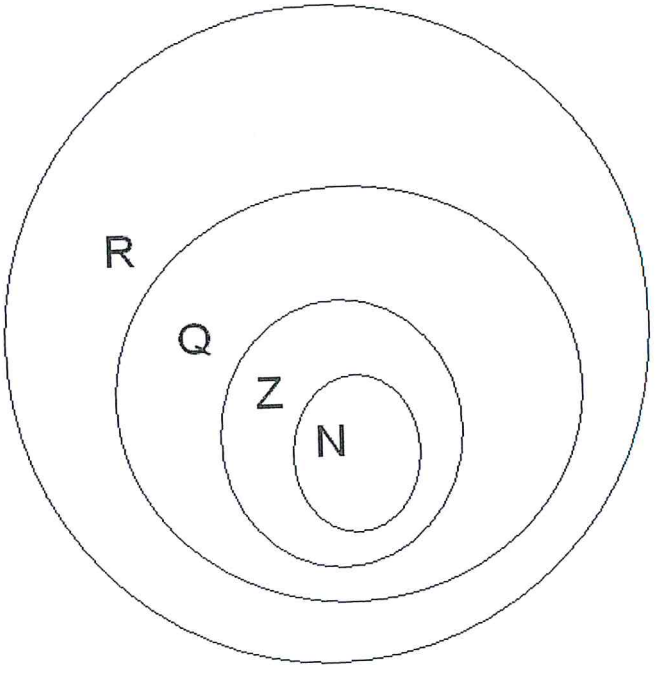
l. $122.53 =$

p. $5.540404040\ldots =$

5. Given the following diagram:

Write the following numbers in the appropriate location in the diagram:

a. 2.2
b. –5
c. 3
d. $\frac{1}{3}$
e. 5
f. –3.3
g. 1.111…
h. $\frac{1}{\sqrt{3}}$
i. 2π
j. $1+2\pi$
k. $\sqrt{2}+3$
l. $\frac{4}{2}$



6. Circle the right option. The number –2 is:

   a. Integer and Natural.
   b. Positive
   c. Integer and Rational
   d. Natural and Real
   e. Natural and Rational
   f. None of the above

7. Circle the right option. The number 3.41414141..... is:

   a. Integer and Natural.
   b. Natural
   c. Integer and Real
   d. Rational and Integer
   e. Rational
   f. None of the above

8. Circle the right option. The number 3.41 is:

   a. Integer and Natural.
   b. Integer
   c. Rational and Real
   d. Integer and Real
   e. Rational and negative
   f. None of the above

9. Circle the right option. The number $\sqrt{31}$ is:

   a. Integer and Natural.
   b. Integer
   c. Decimal
   d. Integer and Real
   e. Rational
   f. Irrational

10. Circle the right option. The number 5 is:

   a. Natural.
   b. Integer
   c. Real
   d. Integer and Natural
   e. Rational and Natural
   f. All of the above

2.2. – SIGNIFICANT FIGURES

Whenever a measurement is performed an error is committed. The error can be caused by insufficient precision of the measuring device used, by the person doing the measurement, etc. Communicating our uncertainty in a measurement is as important as the measurement itself. The following rules help us to communicate our measurements better:

1. Significant figures in a measurement include all of the digits that are known precisely plus one last digit that is estimated.
2. Non–zero digits are always significant: 203.230002
3. All **final zeros** after the decimal point are significant: 2.7450 ; 0.1420
4. Zeros between two other significant digits are always significant: 70.0 ; 1002 ; 9.000
5. Zeros used only for spacing the decimal point are **not** significant: 100 ; 0.00078
6. On adding or subtracting, the answer is rounded to the same number of _____ as the measurement with the least number of decimal places.
7. On multiplying or dividing two numbers, the answer is rounded off to the number of _____ in the least precise term used in the calculation

Determine the number of significant digits in each of the following:

1. 273.20 cm _____
2. 4513.01 L _____
3. 2.00011 km _____
4. 0.0001010450 sec _____
5. 4.75 kg _____
6. 1.0 _____
7. 10.0 _____
8. 10 _____
9. 1.0 _____
10. 9.401°C _____
11. 0.2 ml _____
12. 314 kg _____
13. 2000.103 mm _____
14. 704,000 h _____

Answer using proper number of significant figures:

11. 3.414 s + 10.02 s + 58.325 s + 0.00098 s = _____

12. 2.326 h – 0.10408 h = _____

13. 10.19 m x 0.013 m = _____

14. 140.01 cm x 26.042 cm x 0.0159 cm = _____

15. 80.23 m / 2.4 s = _____

16. 4.301 kg / 1.9 cm^3 = _____

17. A Chemical experiment involves the following substances:

    85.238 g of Iron, 32.1 g of Water, 0.0026 g of Oil, 7.13 g of Glass

    a. How many significant digits are there in each measurement?
    b. What is the total mass of substances in this experiment?
    c. How many significant digits are there in the answer to part b?

18. A certain living room was measured to be 12.412m long and 5.212m wide. Determine:

    a. The area of the living room to the correct number of decimal places.

    b. The area of the living room to 3 significant figures.

    c. The area of the living room to 4 significant figures.

    d. The area of the living room to 1 decimal place.

    e. The perimeter of the living room to the correct number of decimal places.

    f. The perimeter of the living room to 3 significant figures.

    g. The perimeter of the living room to 4 significant figures.

    h. The perimeter of the living room to 1 decimal place.

19. You measured 17.40 ml of water in a certain recipient. After a certain experiment 9.0 ml of water was left.

    a. Which measurement is more precise, before or after the experiment? Explain.
    b. How much water was consumed during the experiment?

2.3. – SCIENTIFIC NOTATION

1. How many significant figures does the measurement of 100 mm have? _____ However, what if whoever performed the measurement was accurate to within 1 mm? How can the experimenter report the measurement with the appropriate number of significant figures?

2. Reporting the value as 100.0 suddenly turns the term having one significant digit into a term having _____.

3. The solution to this problem is called "scientific notation". In this case the solution to the problem would be: _____. With this notation, it is clear that three significant digits are intended.

4. Typically a _____ is placed to the left of the decimal, and this number is then multiplied by the appropriate _____. Our experimenter could report the measured quantity as 10.0×10^1 mm, but the first version is more common.

Write the following numbers in scientific notation and indicate the number of significant figures, later write with 3 significant figures:

1. 1026.90 = _____ 3S.F._____
2. 0.03045 = _____ 3S.F._____
3. 12,000 = _____ 3S.F._____
4. 0.00690 = _____ 3S.F._____

Write In scientific notation (use appropriate number of significant figures):

5. 0.11 = _____
6. 0.015 = _____
7. 0.0071 = _____
8. 0.0000001 = _____
9. 1.2 = _____
10. 1.02 = _____

11. 0.3 = _____

12. 0.00004 = _____

13. 0.06023 = _____

14. 0.000345 = _____

15. 0.00155 = _____

16. 0.0000204 = _____

17. 100 = _____

18. 10100 = _____

19. 11.0 = _____

20. 200 = _____

21. 201 = _____

22. 10.00 = _____

23. 101.0 = _____

24. 1.200 = _____

25. 1500 = _____

26. 2000 = _____

27. 51223 = _____

28. 100.80 = _____

29. 209.1 = _____

30. 24.18 = _____

31. 5500 = _____

32. 766600 = _____

33. 54000 = _____

34. 44500 = _____

35. 65000 = _____

36. 0.00545 = _____

37. 0.001545 = _____

38. 0.00020545 = _____

39. 0.050425 = _____

40. 0.0050545 = _____

41. 70000 = _____

Calculate giving your answers in scientific notation with the proper number of significant figures.

42. $(6.6 \cdot 10^{-8}) / (3.30 \cdot 10^{-4}) =$ _____

43. $(1.56 \cdot 10^{-7}) + (2.43 \cdot 10^{-8}) =$ _____

44. $(7.4 \cdot 10^{10}) / (3.7 \cdot 10^{3}) =$ _____

45. $(2.5 \cdot 10^{-8}) \cdot (3.0 \cdot 10^{-7}) =$ _____

46. $(2.67 \cdot 10^{-3}) - (9.5 \cdot 10^{-4}) =$ _____

47. $(2.3 \cdot 10^{-4}) \cdot (2.0 \cdot 10^{-3}) =$ _____

2.4. – SETS

1. A set is _____.

2. Give 3 examples of sets:

3. Consider the set {2, 4, 6, …}

   a. This is the set of _____. The next element is ___

   b. In this set the number of elements is _____It is an _____ set

4. Consider the set {1, 8, 27, …}

   a. This is the set of _____. The next element is ___

   b. In this set the number of elements is _____It is an _____ set

5. Consider the set {Asia, Africa, …}

   a. This is the set of _____. The next element is ___

   b. In this set the number of elements is _____It is an _____ set

6. A **subset** is _____. It is denoted by $A \subseteq B$

7. Given the set L = {A, B, C}

   a. State all the possible subsets of L. include the empty set.

      L1 = _____

      L2 = _____

      L3 = _____

      L4 = _____

      L5 = _____

      L6 = _____

      L7 = _____

      L8 = _____

   b. All the subsets except _____ are called **proper subsets denoted by** $A \subset B$

   c. Explain the difference between a subset and a propersubset.

   d. $A \not\subset B$ means _____

   e. _____ means that A is NOT a subset of B

8. M is the set of perfect square smaller than a 100.

   a. List the elements of M _____

   b. List the subset Q of even numbers in M _____

9. N is the set of prime numbers between 10 and 30.

   a. List the elements of M _____

   b. List the subset Q of even numbers in M _____

10. The **universal set** is particular for _____ and contains _____ for the problem. Usually it is denoted by the letter _____.

11. The universal set for the students in the classroom is

U = _____

12. Given the sets U = {John, Raquel, Felix, Shan, Mila, Jessy, Pamela} and the subset of U: B = {Shan, Mila}.

State the complement of the set B' = _____

13. The **complement of a set** _____

14. The **intersection** of 2 sets is _____. It is denoted by $A \cap B$.

15. The **union** of 2 sets is_____. It is denoted by $A \cup B$

16. For example if S = {1, 2, 3, 4, 5, 6, 7, 8, 9} and M = {2, 6, 10, 12}

a. $S \cap M =$_____

b. $S \cup M =$_____

17. Given the sets U = {John, Raquel, Felix, Shan, Mila, Jessy, Pamela} and the subset of U: B = {Shan, Mila}.

a. $U \cap B =$_____

b. $U \cup B =$_____

18. Two set are said to be "**disjoint**" in case_____

Example:

19. Two set are equal in case _____

Example:

VENN DIAGRAMS

Event	Set Language	Venn diagram	Probability result
Complementary event (A')	Not A		P(A') =
The _____ of A and B $(A \cap B)$	Set of elements that belongs to A _____ B		$P(A \cup B) =$
The _____ of A and B $(A \cup B)$	Set of elements that belongs to A _____ B ___ both		
If $(A \cap B) = \varnothing$ A and B are said to be: _____	The sets A and B are _____		$P(A \cup B) =$ $P(A \cap B) =$

20. The **commutative** property of a set means that:_____

    Example: $A \cup B =$ _____

21. The **associative** property of a set means that: :_____

    Example: $(A \cup B) \cup C =$ _____

22. The **distributive** property of a set means that: :_____

    Example: $C \cup (A \cap B) =$ _____

    $C \cap (A \cup B) =$ _____

23. Given N, the set of natural numbers, Z the set of integers, Q the set of rationals and R the set of Real numbers.

    a. Write down an element of the set $N \cap Z$: _____

    b. Write down an element of the set $Q \cap Z$: _____

    c. Write down an element of the set $Q \cap Z'$: _____

    d. Write down an element of the set $Q' \cap Z$: _____

    e. Write down an element of the set $R \cap Q$: _____

    f. Write down an element of the set $R \cap Q'$: _____

    g. Write down an element of the set $N \cap N'$: _____

24. Consider the sets: $U = \{x \in N\}$

$A = \{x \in N \mid 11 < x < 21\}$, B={multiples of 4}, and C ={13, 16, 18, 20}

a. Write all the elements of the set A ∩ B: _____

b. Write all the elements of the set A ∩ C: _____

c. Write all the elements of the set B ∩ C: _____

d. Write all the elements of the set B ∪ C: _____

e. Write all the elements of the set A ∩ (B' ∪ C): _____

f. Write all the elements of the set A ∩ (B ∪ C'): _____

g. Write all the elements of the set A ∩ B ∩ C'): _____

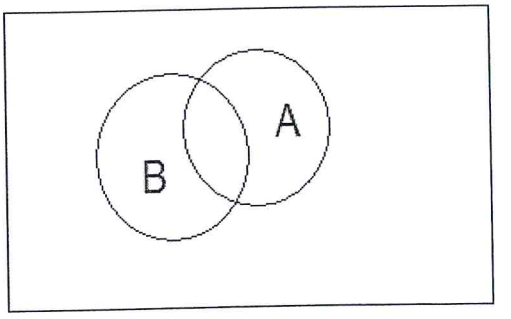
h. True/False: $11 \in A$ True/False: $11 \in A'$

i. True/False: $13 \in A \cap C$ True/False: $30 \notin B$

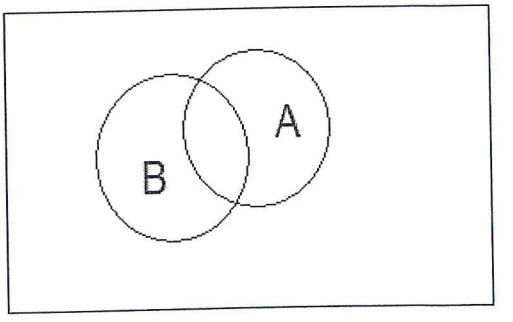
j. True/False: $12 \in A \cap B$ True/False: $30 \notin C$

k. True/False: $B \subset A$ True/False: $C \subset A$

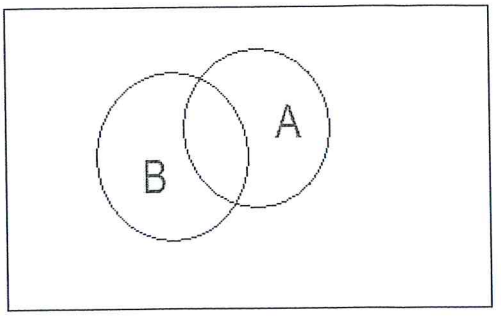
25. Given the Venn diagram. Shade A ∩ B



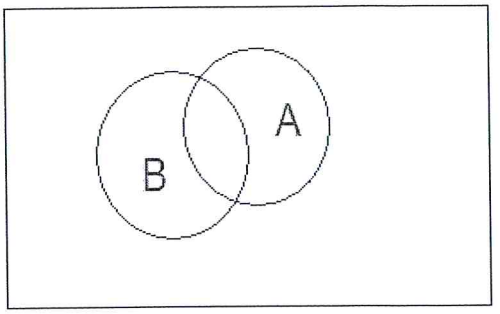
26. Given the Venn diagram. Shade A ∩ B'



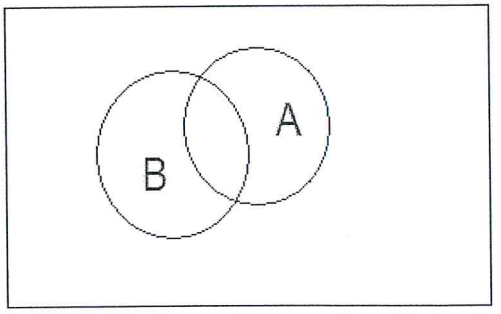
27. Given the Venn diagram. Shade B'



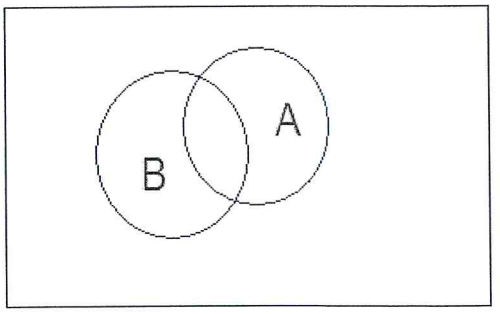
28. Given the Venn diagram. Shade A' $\cap$ B'



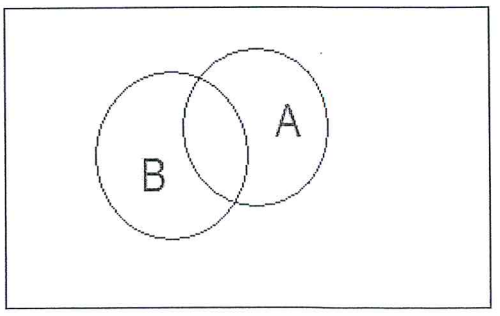
29. Given the Venn diagram. Shade A $\cup$ B



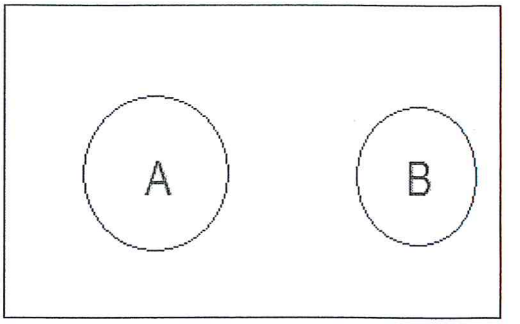
30. Given the Venn diagram. Shade A' $\cup$ B



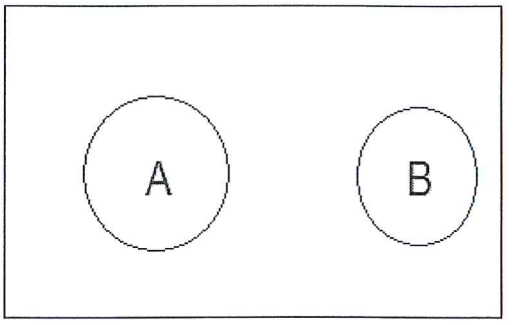
31. Given the Venn diagram. Shade A' $\cup$ B'



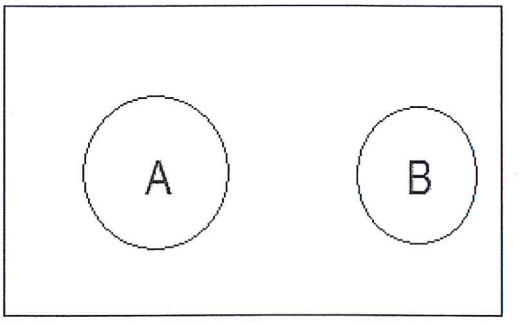
32. Given the Venn diagram. Shade $A \cup B$



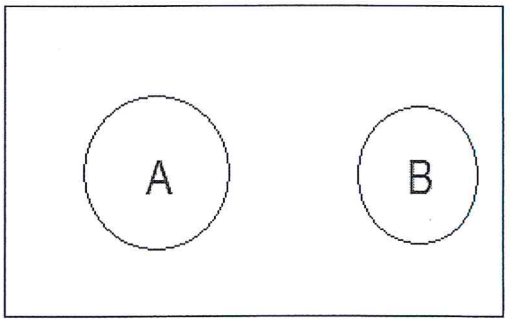
33. Given the Venn diagram. Shade $A \cup B'$



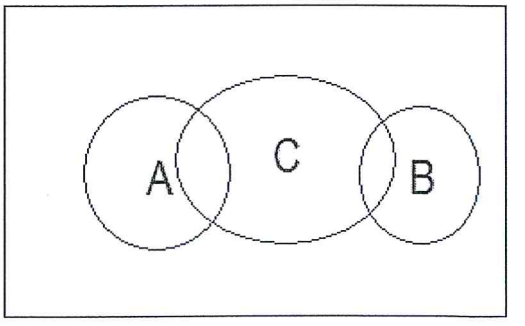
34. Given the Venn diagram. Shade $A \cap B'$



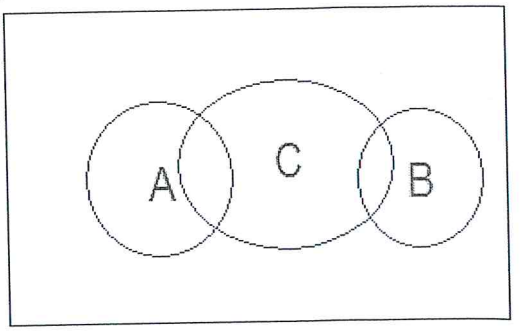
35. Given the Venn diagram. Shade $A \cap B$



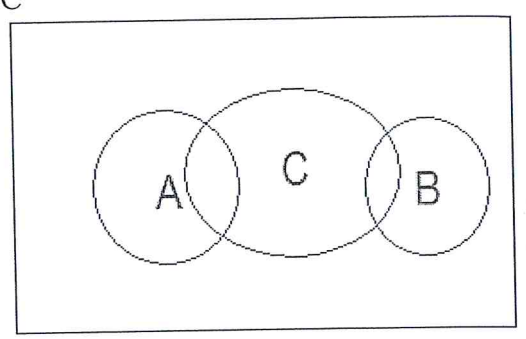
36. Given the Venn diagram. Shade $A \cap B \cap C$



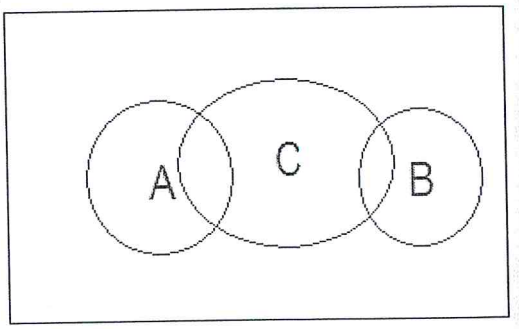
37. Given the Venn diagram. Shade $(A \cup B) \cap C$



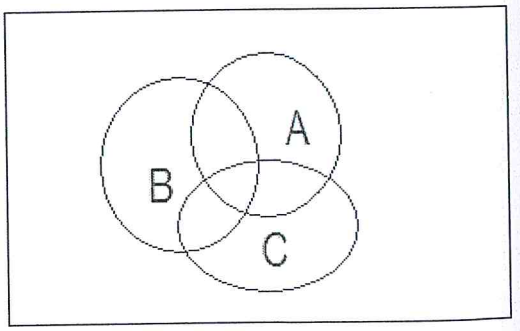
38. Given the Venn diagram. Shade $(A' \cup B) \cap C$



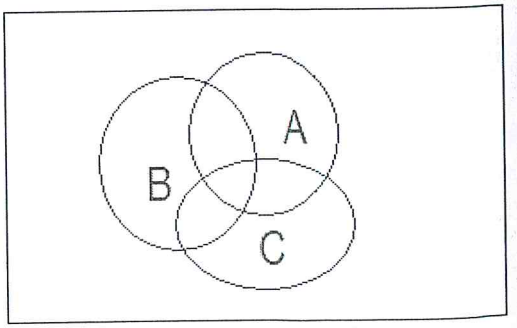
39. Given the Venn diagram. Shade $(A \cup B) \cap C'$



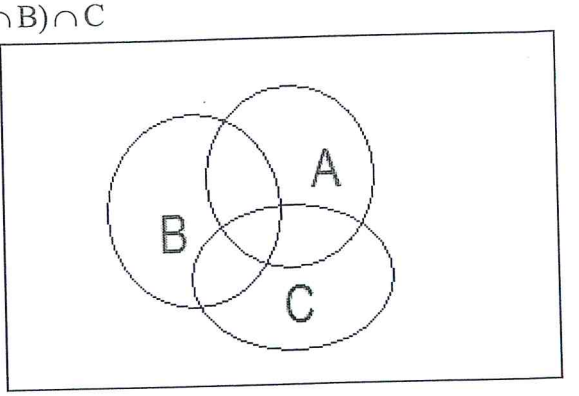
40. Given the Venn diagram. Shade $A \cap B \cap C$



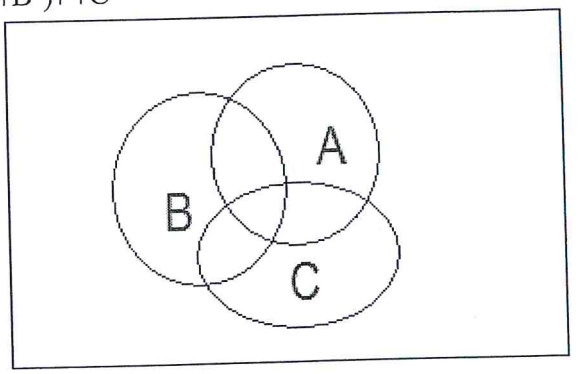
41. Given the Venn diagram. Shade $(A \cap B) \cap C'$



42. Given the Venn diagram. Shade $(A' \cap B) \cap C$



43. Given the Venn diagram. Shade $(A \cap B') \cap C$

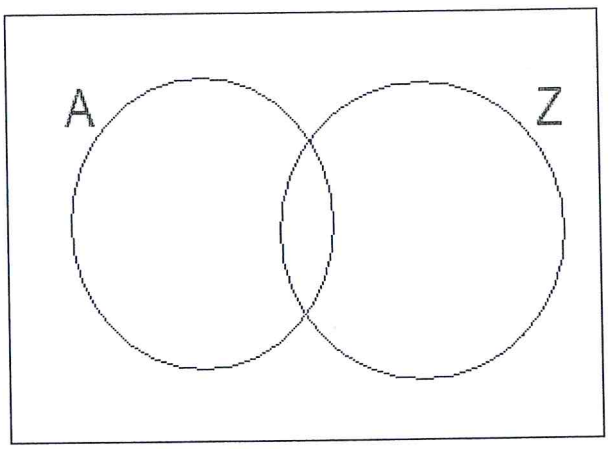


44. 50 drivers were asked about the favourite car colour. 3 choices were given: Red (X), Blue (Y) and White (Z). The results were:

15 liked all three
3 liked red and blue only
9 liked red and white only
7 liked blue and white only
2 liked red only
5 liked white only
1 liked blue only

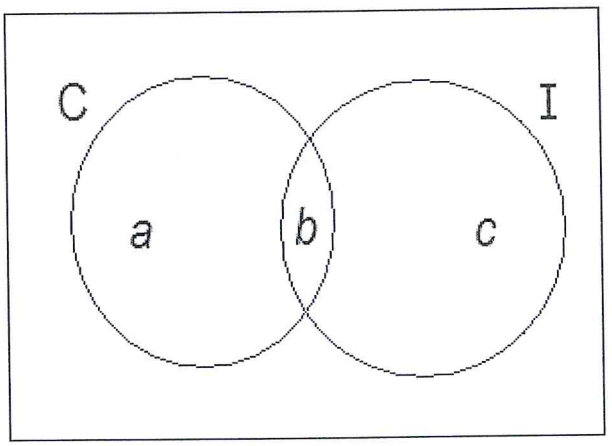
a. Represent this information in a Venn diagram. Fill the Venn diagram with all the corresponding numbers.
b. Write down the percentage of drivers that did not like any of the 3 colours.

45. Given the sets U = {Real numbers}, A={Negative numbers}, Z={Integers}



Write the following numbers in the correct region: cos(0), 0.5, $-\pi$, 5^{-2}, -7, 0

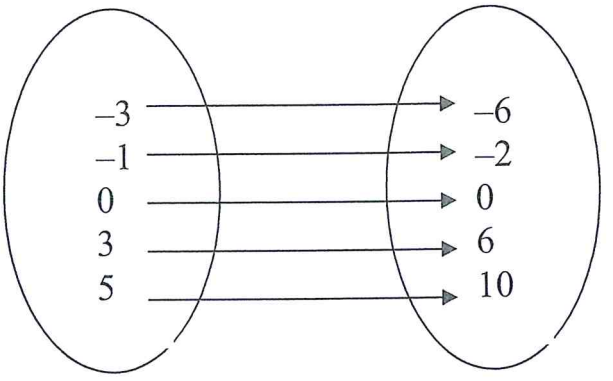
46. In a certain hospital in which there are 70 nurses, 20 work in cardiac surgery (C) and 15 others in the intensive care unit (I). 8 nurses work in both units.



a. a = ____ b = ____ c = ____

b. Calculate the number of nurses that work outside of the cardiac surgery or intensive care units.

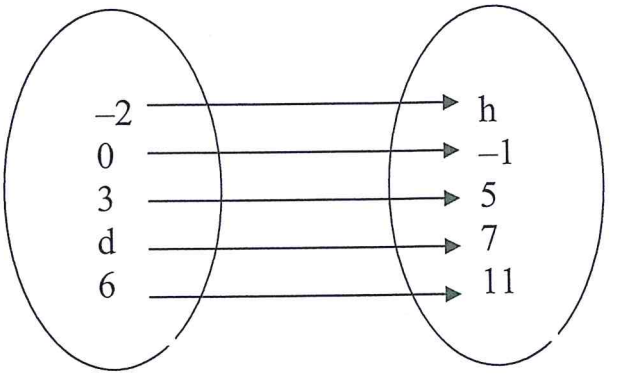
47. Given the following sets:



a. Write down the paires created by this mapping from one set to another:

b. Can you write a mathematical expression to express this mapping¿?

48. Given the following setts:



a. Can you write a mathematical expression to express this mapping?

b. Find h. Find d.

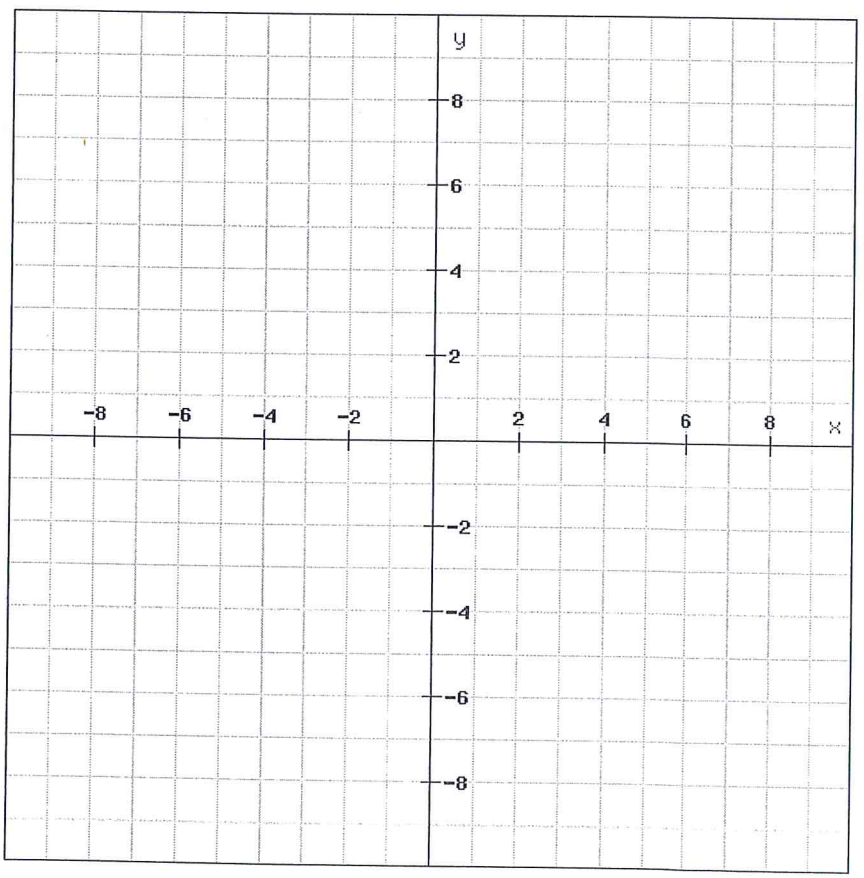
CHAPTER 3

3.1. – LINEAR FUNCTIONS

1. Given the function: f(x) = –5, Complete the following table:

x	–5	–4	–3	–2	–1	0	1	2	3	4	5
f(x)											

- Sketch the points of the chart on a graph (use a ruler).
- State the domain of the function: _____
- State the *y* intercept (sketched on the graph: (____, ____)
- State the *x* intercept: (____, ____)
- The function is increasing on the interval: _____
- The function is decreasing on the interval: _____
- Sketch the function of the graph used for the points initially drawn
- State the range of the function: _____

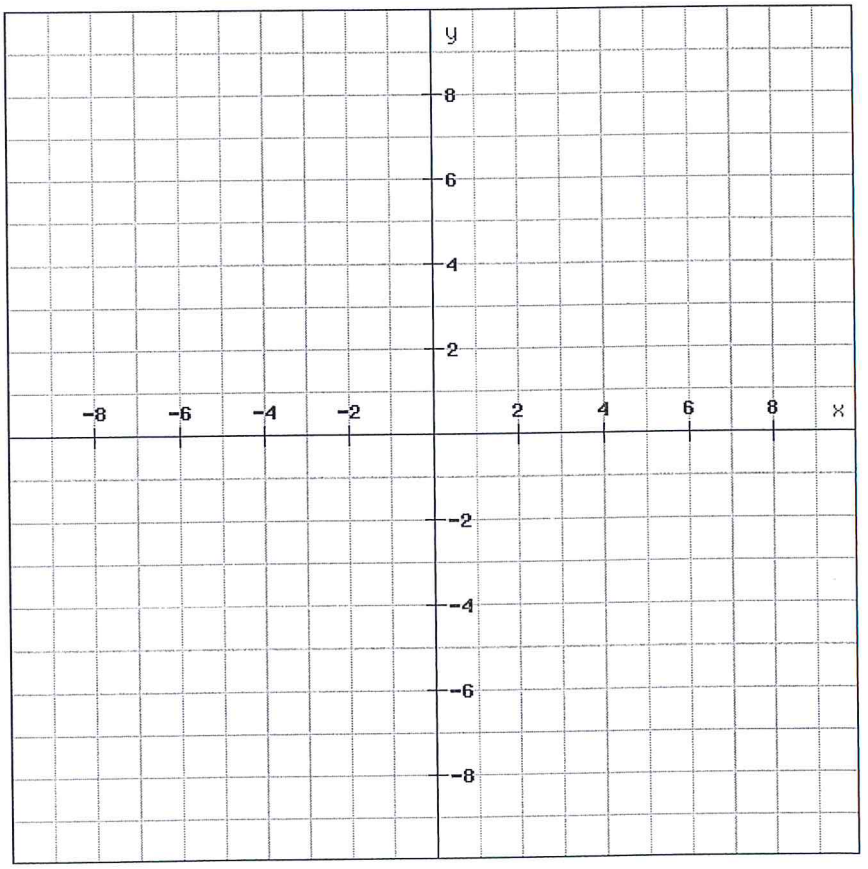


2. Given the function: $f(x) = x + 3$

- Complete the following table:

x	–5	–4	–3	–2	–1	0	1	2	3	4	5
f(x)											

- Sketch the points of the chart on a graph (use a ruler).
- State the domain of the function: _____
- State the *y* intercept (sketched on the graph: (____, ____)
- State the *x* intercept: (____, ____)
- The function is increasing on the interval: _____
- The function is decreasing on the interval: _____
- Sketch the function of the graph used for the points initially drawn
- State the range of the function: _____

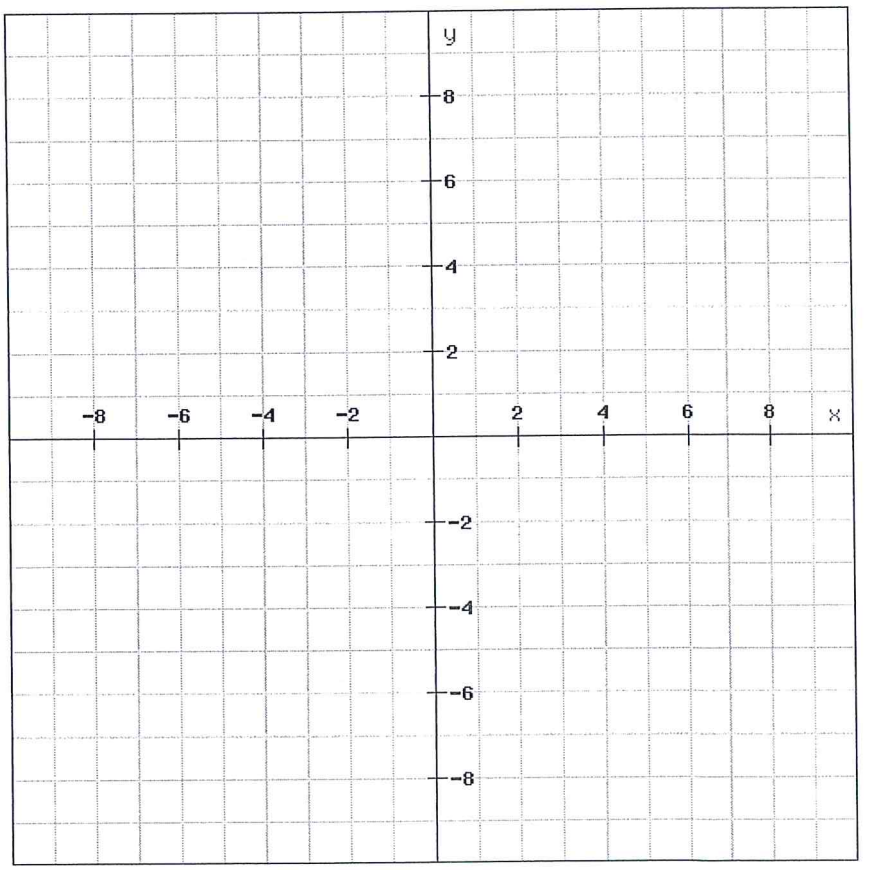


3. Given the function: $f(x) = -2x - 5$

- Complete the following table:

x	–5	–4	–3	–2	–1	0	1	2	3	4	5
f(x)											

- Sketch the points of the chart on a graph (use a ruler).
- State the domain of the function: _____
- State the *y* intercept (sketched on the graph: (____, ____)
- State the *x* intercept: (____, ____)
- The function is increasing on the interval: _____
- The function is decreasing on the interval: _____
- Sketch the function of the graph used for the points initially drawn
- State the range of the function: _____

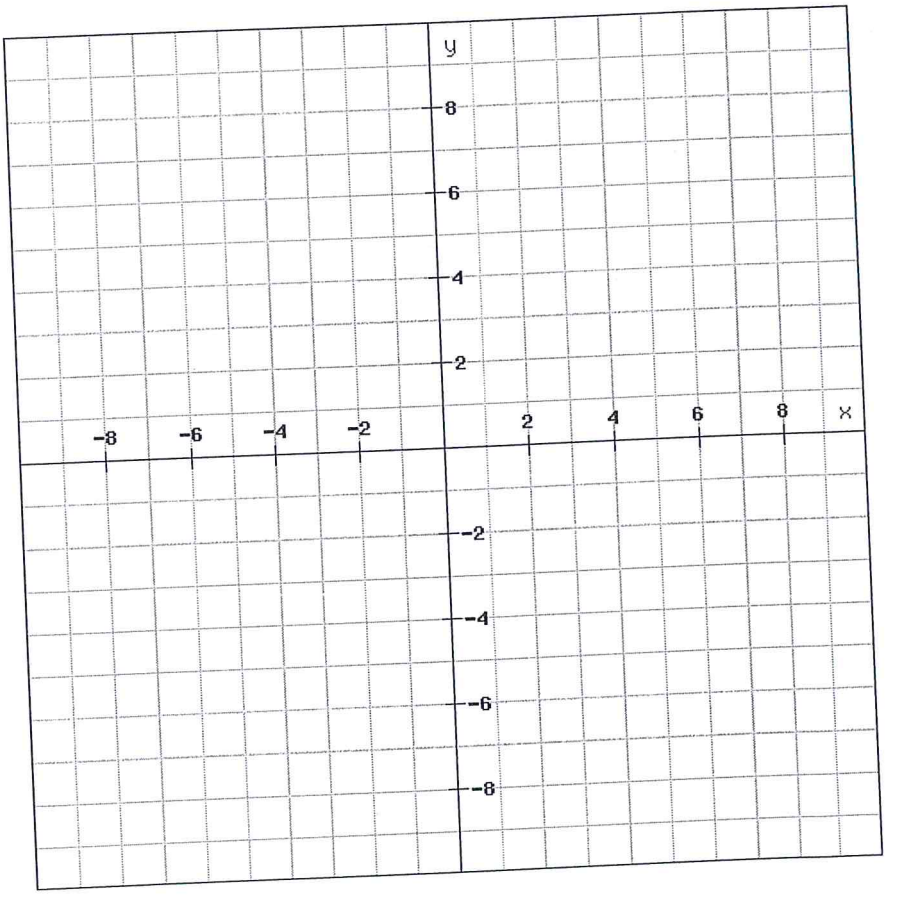


4. Given the function: $f(x) = 4x - 3$

- Complete the following table:

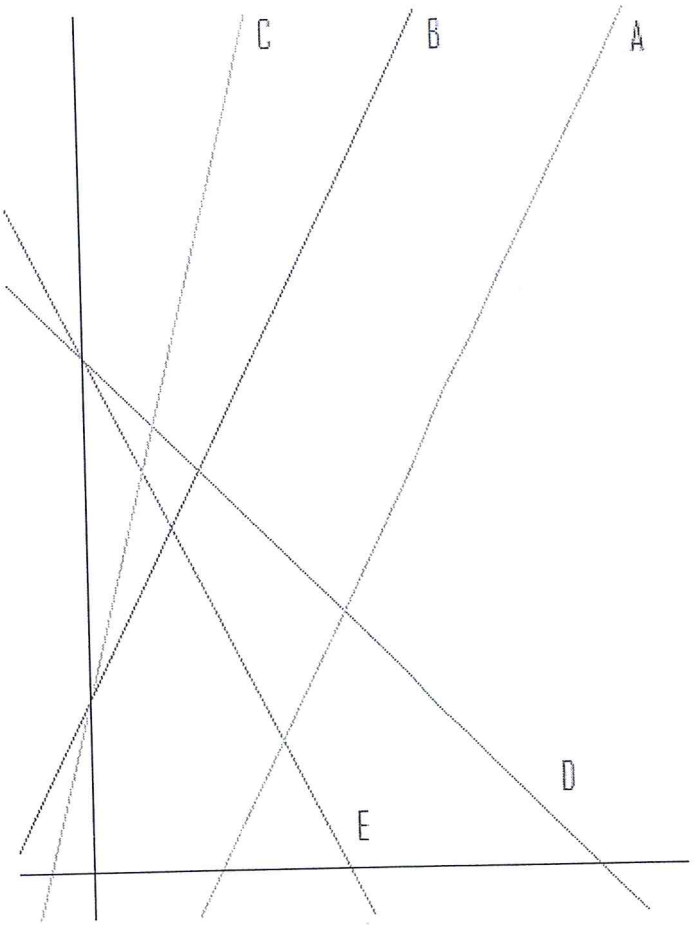
x	–5	–4	–3	–2	–1	0	1	2	3	4	5
f(x)											

- Sketch the points of the chart on a graph (use a ruler).
- State the domain of the function: _____
- State the *y* intercept (sketched on the graph: (____, ____)
- State the *x* intercept: (____, ____)
- The function is increasing on the interval: _____
- The function is decreasing on the interval: _____
- Sketch the function of the graph used for the points initially drawn
- State the range of the function: _____



5. Given below are the equations for five different lines. Match the function with its graph.

Function	On the graph
$f(x) = 20 + 2x$	
$g(x) = 4x + 20$	
$s(x) = -30 + 2x$	
$a(x) = 60 - x$	
$b(x) = -2x + 60$	



6. The general functions that describes a straight line is _____

7. We know a function is a straight line because _____

8. The y–intercept (also called vertical intercept), tells us where the line crosses the _____. The corresponding point is of the form (,).

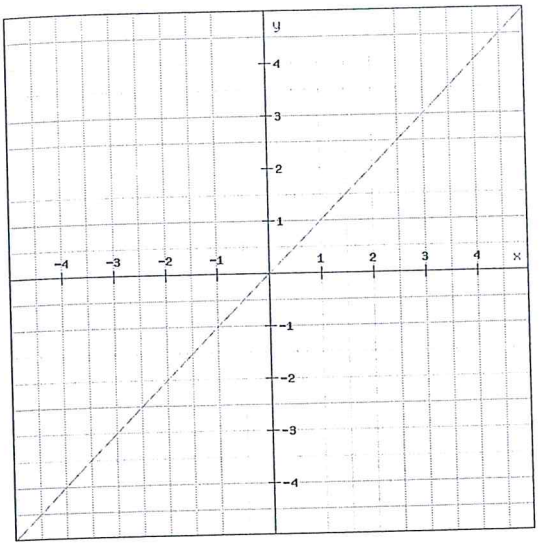
9. The x–intercept (also called horizontal intercept), tells us where the line crosses the _____. The corresponding point is of the form (,).

10. If $m > 0$, the line _____ left to right. If _____ the line decreases left to right.

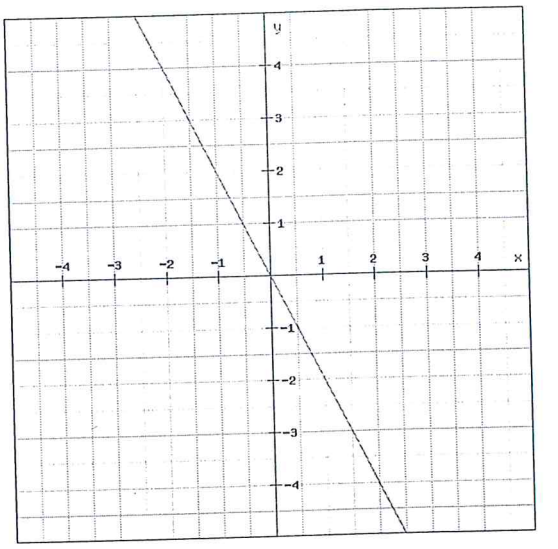
11. In case the line is horizontal m is _____ and the line is of the form _____.

12. The larger the value of m is, the _____ the graph of the line is.

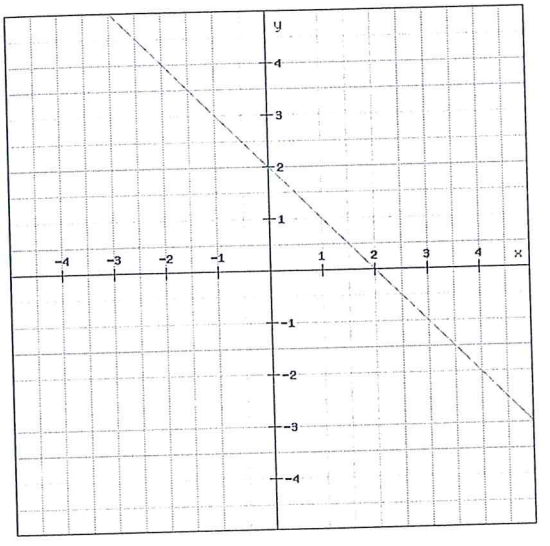
13. Given the graph, write, the slope (m), b and the equation of the line:



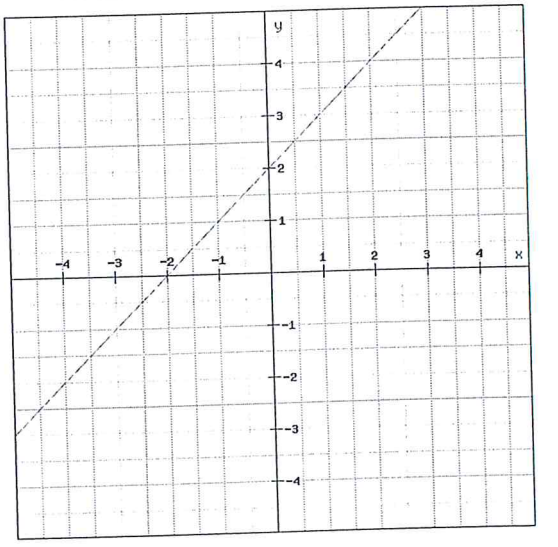
m = ____ b = ____ f(x) = _____



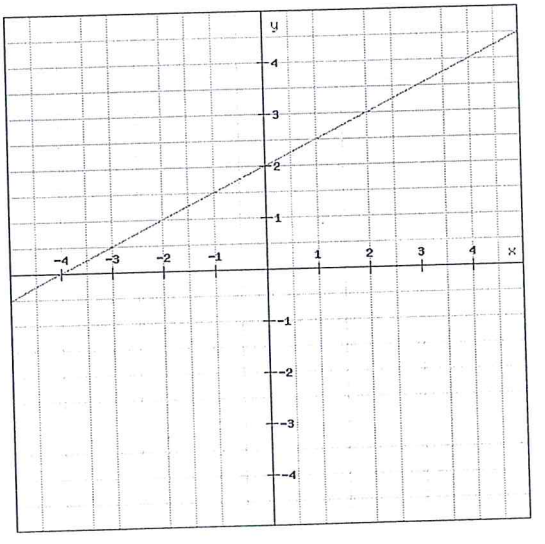
m = ____ b = ____ f(x) = _____



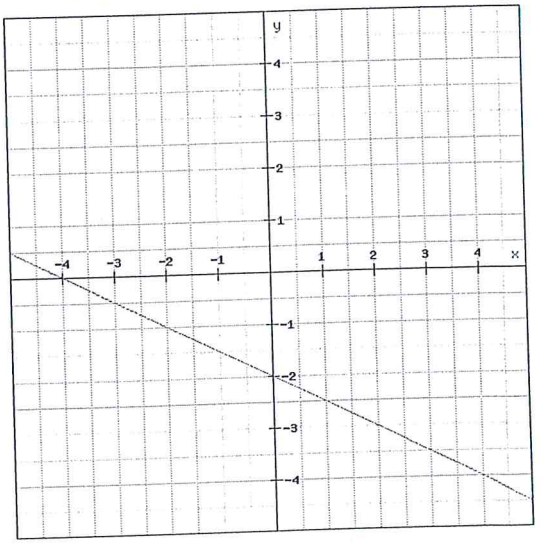
m = ____ b = ____ f(x) = _____



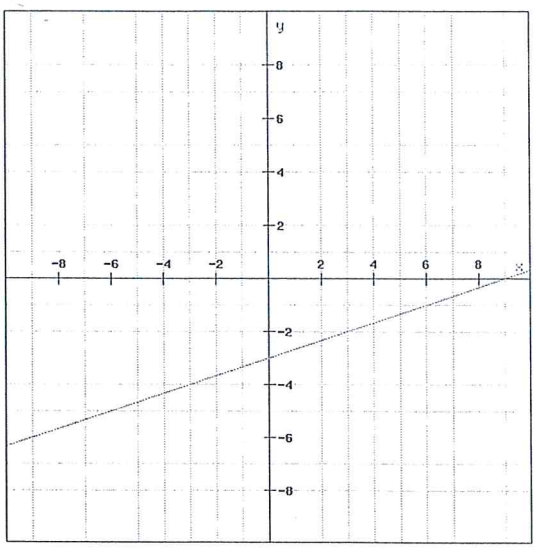
m = ____ b = ____ f(x) = _____



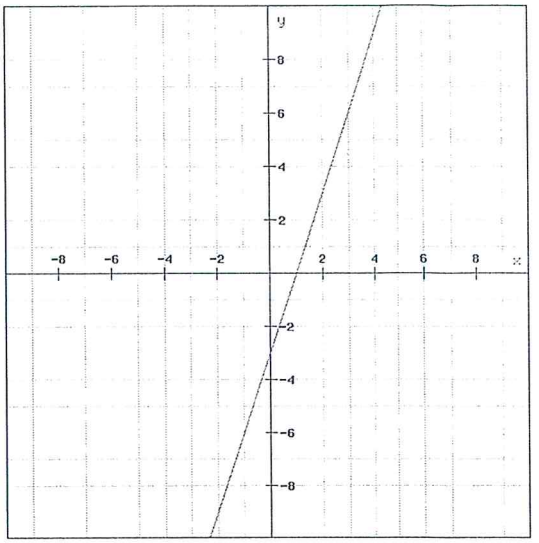
m = ____ b = ____ f(x) = _____



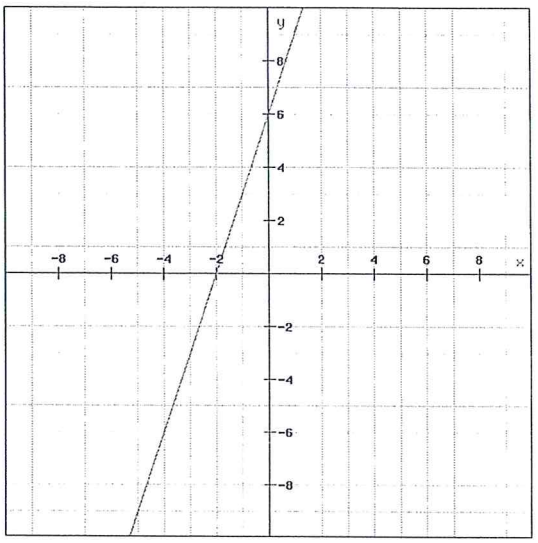
m = ____ b = ____ f(x) = _____



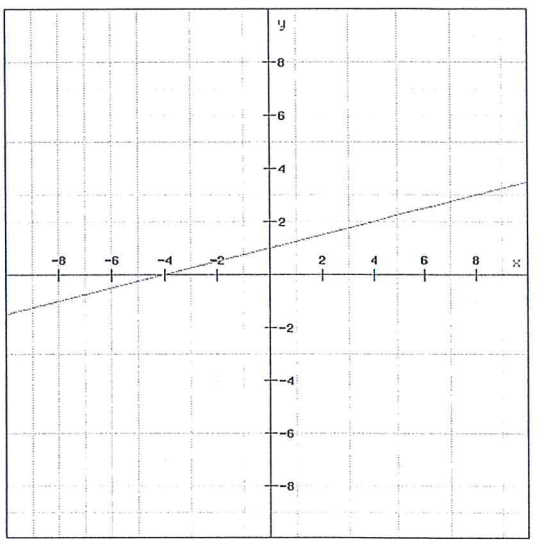
m = ____ b = ____ f(x) = _____



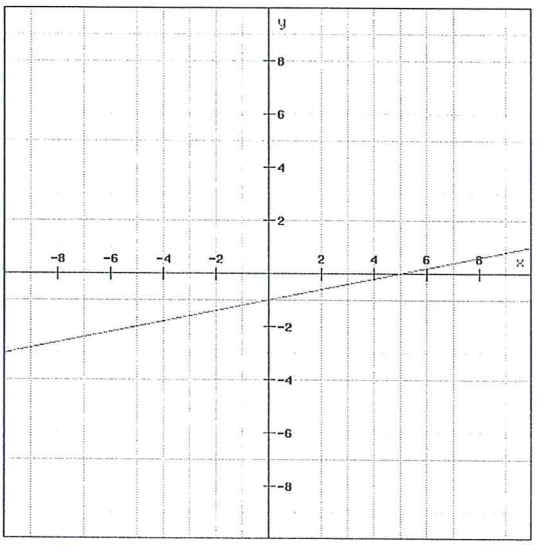
m = ____ b = ____ f(x) = _____



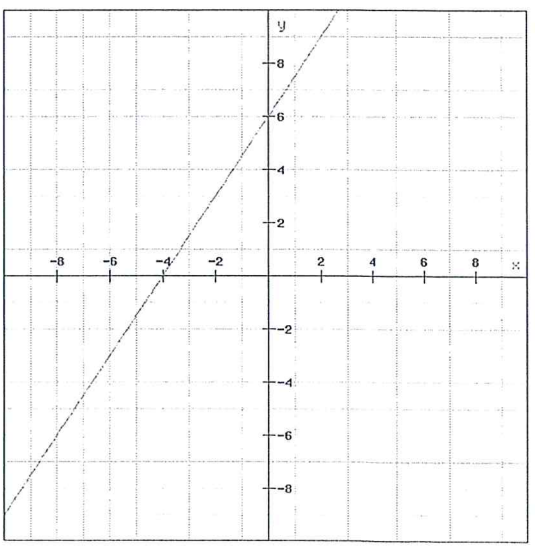
m = ____ b = ____ f(x) = _____



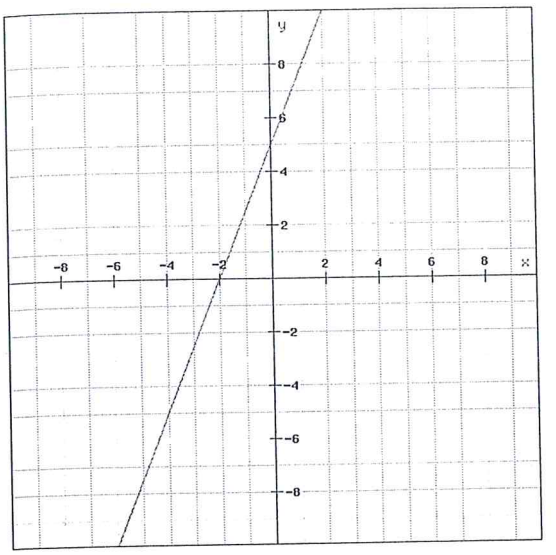
m = ____ b = ____ f(x) = _____



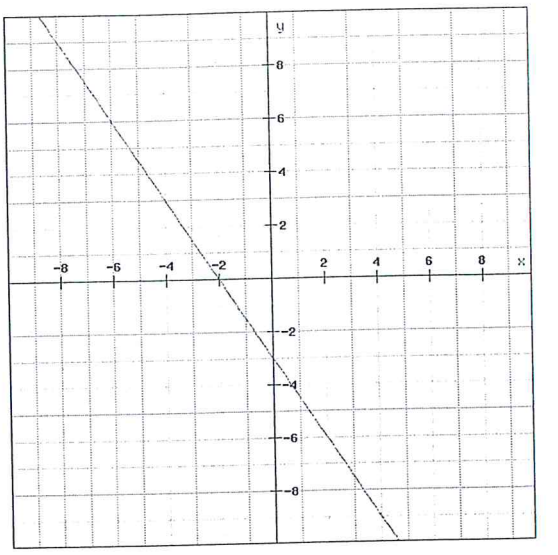
m = ____ b = ____ f(x) = _____



m = ____ b = ____ f(x) = _____



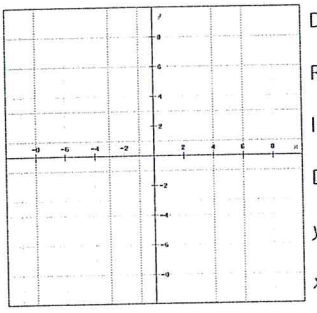
m = ____ b = _____ f(x) = _____



m = ____ b = _____ f(x) = _____

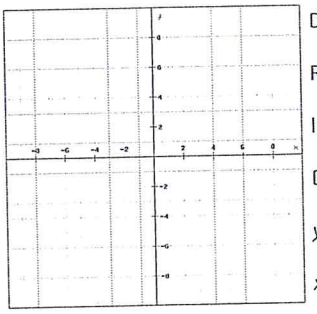
Analyze the following functions:

1. f(x) = 1



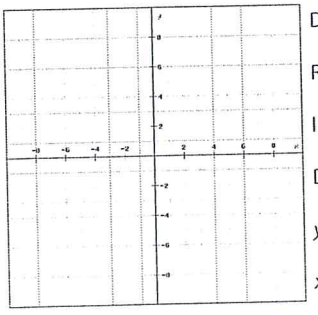
Domain: _____
Range: _____
Increase: _____
Decrease: _____
y intercept: (,)
x intercept: (,)

2. f(x) = 2



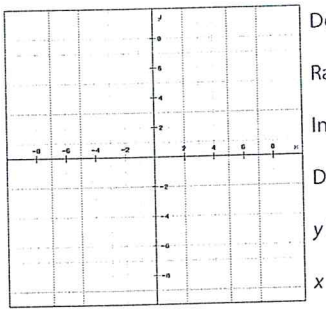
Domain: _____
Range: _____
Increase: _____
Decrease: _____
y intercept: (,)
x intercept: (,)

3. f(x) = –1



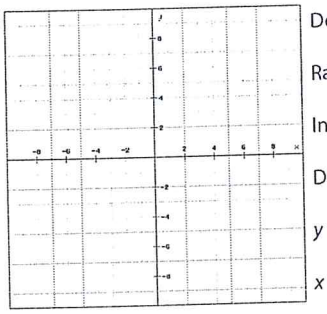
Domain: _____
Range: _____
Increase: _____
Decrease: _____
y intercept: (,)
x intercept: (,)

4. f(x) = 0



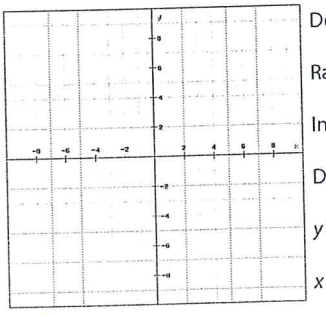
Domain: _____
Range: _____
Increase: _____
Decrease: _____
y intercept: (,)
x intercept: (,)

5. f(x) = x



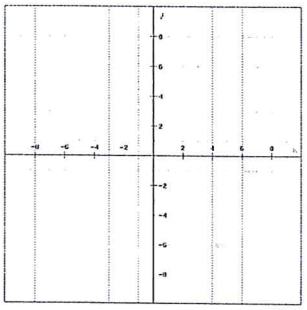
Domain: _____
Range: _____
Increase: _____
Decrease: _____
y intercept: (,)
x intercept: (,)

6. f(x) = x+1



Domain: _____
Range: _____
Increase: _____
Decrease: _____
y intercept: (,)
x intercept: (,)

7. $f(x) = -x$



Domain: _____

Range: _____

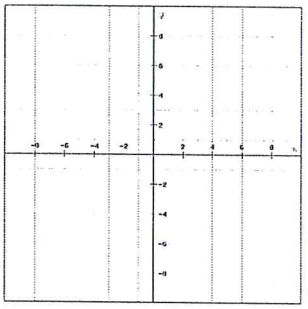
Increase: _____

Decrease: _____

y intercept: (,)

x intercept: (,)

8. $f(x) = -x-2$



Domain: _____

Range: _____

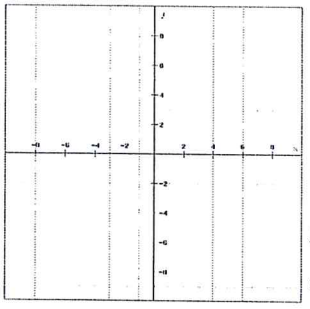
Increase: _____

Decrease: _____

y intercept: (,)

x intercept: (,)

9. $f(x) = 2x$



Domain: _____

Range: _____

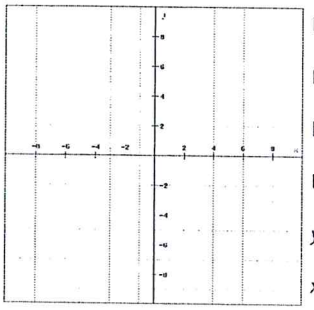
Increase: _____

Decrease: _____

y intercept: (,)

x intercept: (,)

10. $f(x) = 3x - 5$



Domain: _____

Range: _____

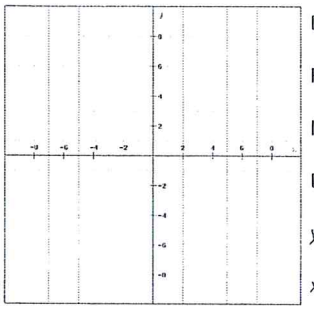
Increase: _____

Decrease: _____

y intercept: (,)

x intercept: (,)

11. $f(x) = 3 - 2x$



Domain: _____

Range: _____

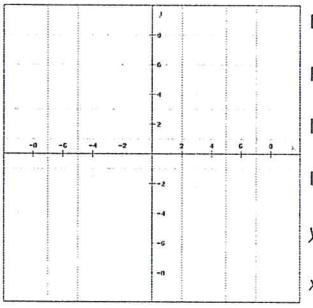
Increase: _____

Decrease: _____

y intercept: (,)

x intercept: (,)

12. $f(x) = \frac{x}{3}$



Domain: _____

Range: _____

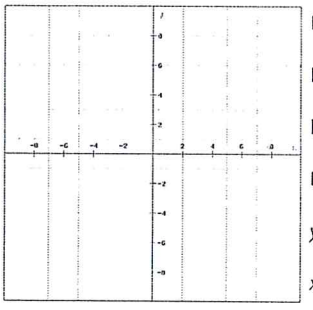
Increase: _____

Decrease: _____

y intercept: (,)

x intercept: (,)

13. $f(x) = 2x+1$



Domain: _____

Range: _____

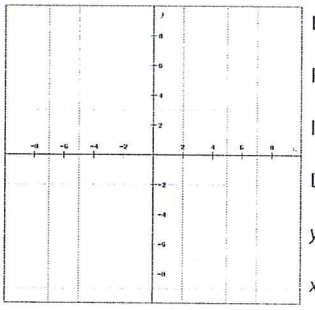
Increase: _____

Decrease: _____

y intercept: (,)

x intercept: (,)

14. $f(x) = 2x-2$



Domain: _____

Range: _____

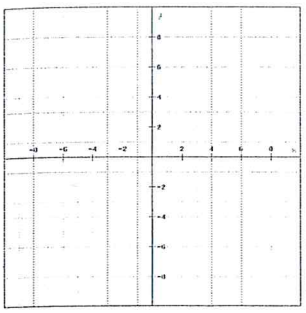
Increase: _____

Decrease: _____

y intercept: (,)

x intercept: (,)

15. $f(x) = 3x+5$



Domain: _____

Range: _____

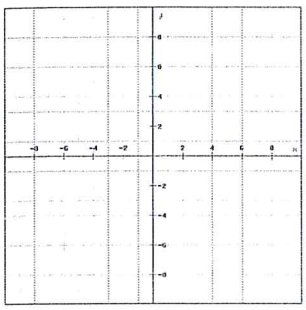
Increase: _____

Decrease: _____

y intercept: (,)

x intercept: (,)

16. $f(x) = \frac{x}{2} - 5$



Domain: _____

Range: _____

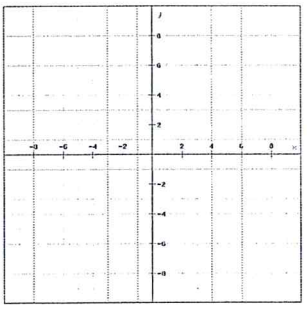
Increase: _____

Decrease: _____

y intercept: (,)

x intercept: (,)

17. $f(x) = \frac{x}{4} + 6$



Domain: _____

Range: _____

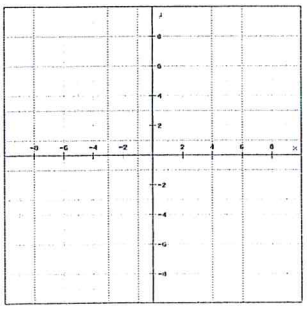
Increase: _____

Decrease: _____

y intercept: (,)

x intercept: (,)

18. $f(x) = \frac{3}{2}x - 5$



Domain: _____

Range: _____

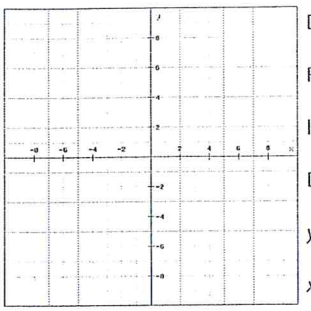
Increase: _____

Decrease: _____

y intercept: (,)

x intercept: (,)

19. $f(x) = -\frac{3}{2}x - \frac{3}{2}$



Domain: _____

Range: _____

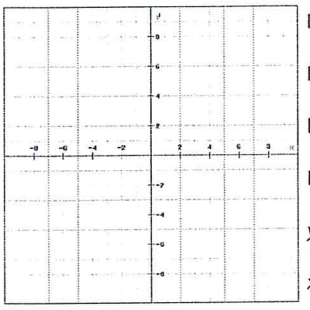
Increase: _____

Decrease: _____

y intercept: (,)

x intercept: (,)

20. $f(x) = -\frac{1}{2}x - \frac{3}{2}$



Domain: _____

Range: _____

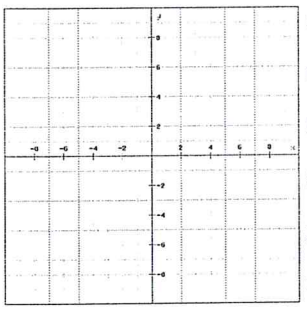
Increase: _____

Decrease: _____

y intercept: (,)

x intercept: (,)

21. $f(x) = \frac{7}{2}x - \frac{1}{4}$



Domain: _____

Range: _____

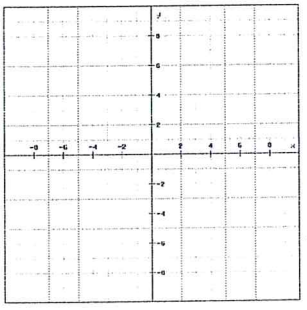
Increase: _____

Decrease: _____

y intercept: (,)

x intercept: (,)

22. $f(x) = -\frac{9}{5}x + \frac{8}{3}$



Domain: _____

Range: _____

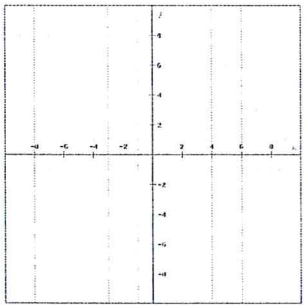
Increase: _____

Decrease: _____

y intercept: (,)

x intercept: (,)

23. $3x + 2y = 2$



Domain: _____

Range: _____

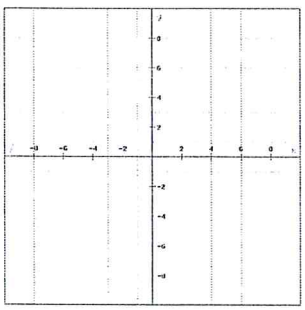
Increase: _____

Decrease: _____

y intercept: (,)

x intercept: (,)

24. $4x - 2y - 3 = 1$



Domain: _____

Range: _____

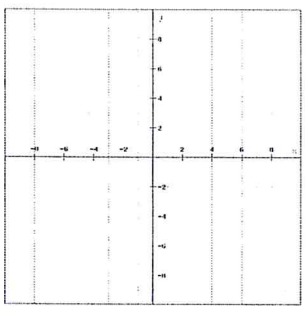
Increase: _____

Decrease: _____

y intercept: (,)

x intercept: (,)

25. $-2y + 3x = -5$



Domain: _____

Range: _____

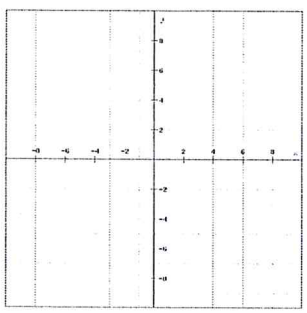
Increase: _____

Decrease: _____

y intercept: (,)

x intercept: (,)

26. $y - x = 2$



Domain: _____

Range: _____

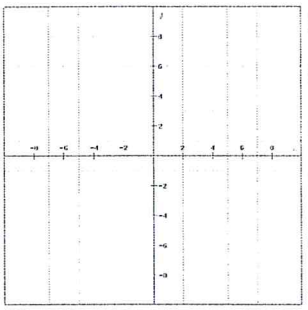
Increase: _____

Decrease: _____

y intercept: (,)

x intercept: (,)

27. $y + 2x - 3 = 1$



Domain: _____

Range: _____

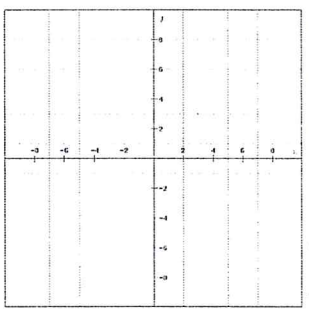
Increase: _____

Decrease: _____

y intercept: (,)

x intercept: (,)

28. $5y + 5x = 5$



Domain: _____

Range: _____

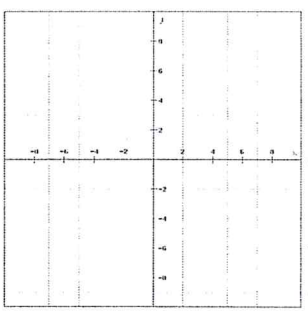
Increase: _____

Decrease: _____

y intercept: (,)

x intercept: (,)

29. $2x - 2y - 3 = 1$



Domain: _____

Range: _____

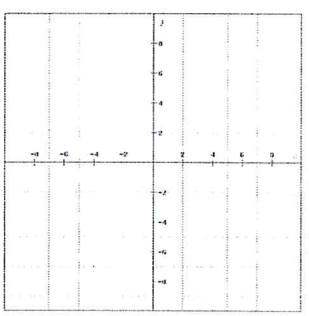
Increase: _____

Decrease: _____

y intercept: (,)

x intercept: (,)

30. $x - 2y - 150 = 0$



Domain: _____

Range: _____

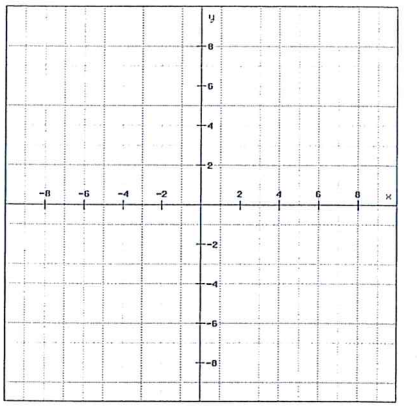
Increase: _____

Decrease: _____

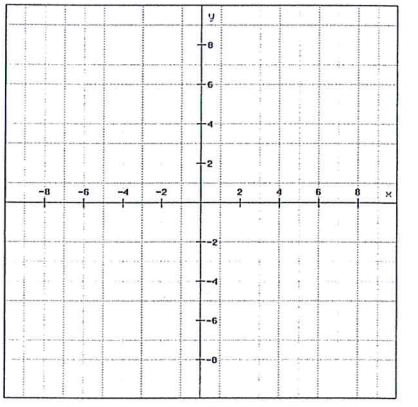
y intercept: (,)

x intercept: (,)

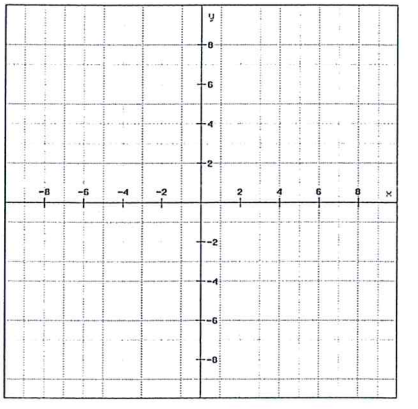
31. Write the equation of the line that has a slope of 2 and passes through the point (2, 4) in the forms: $y = mx + b$ and $ax + by + c = 0$, $(a, b \in Z)$



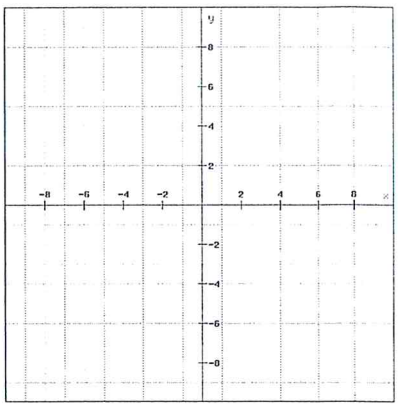
32. Write the equation of the line that has a slope of $-\frac{1}{2}$ and passes through the point $(-2, -3)$ in the forms: $y = mx + b$ and $ax + by + c = 0$, $(a, b \in Z)$



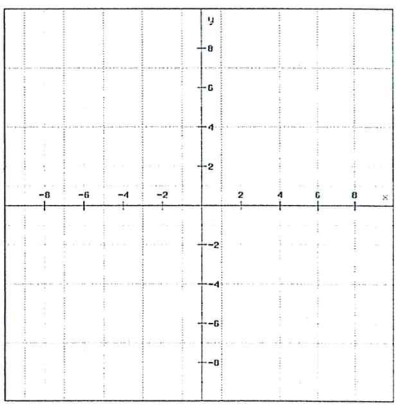
33. Write the equation of the line that has a slope of $-\frac{5}{2}$ and passes through the point $(-1, 2)$ in the forms: $y = mx + b$ and $ax + by + c = 0$, $(a, b \in Z)$



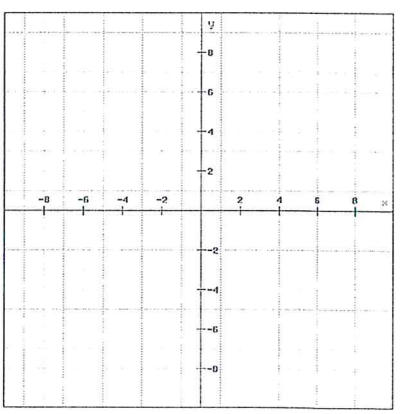
34. Find the equation of the line that passes through the points (1, 1), (2, 4), indicate its y and x intercepts and sketch it. Write its equation in the forms: $y = mx + b$ and $ax + by + c = 0$, $(a, b \in Z)$



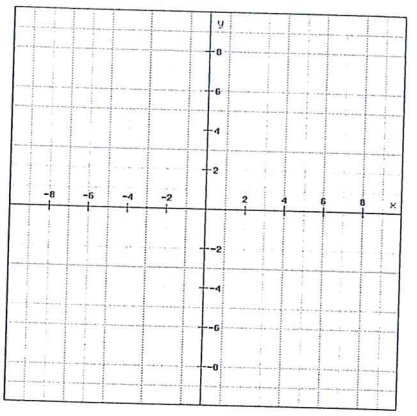
35. Find the equation of the line that passes through the points (–1, –5), (4, 3), indicate its y and x intercepts and sketch it. Write its equation in the forms: $y = mx + b$ and $ax + by + c = 0$, $(a, b \in Z)$



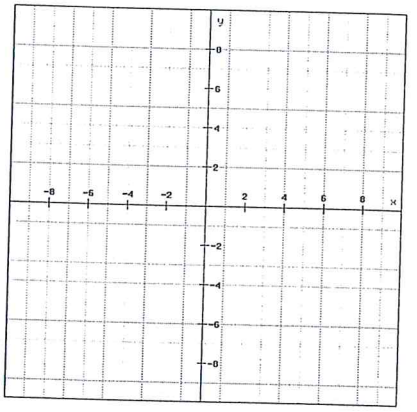
36. Find the equation of the line that passes through the points (–5, 1), (–2, 4), indicate its y and x intercepts, sketch it and write it in both formas $y = mx + b$ and $ax + by + c = 0$, $(a, b \in Z)$



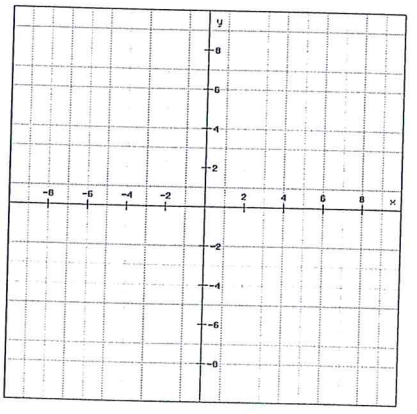
37. Write the equation of the line that is parallel to the line $y = 5x - 2$ and passes through the point $(-2, -1)$. Write its equation in the forms: $y = mx + b$ and $ax + by + c = 0$, $(a, b \in Z)$



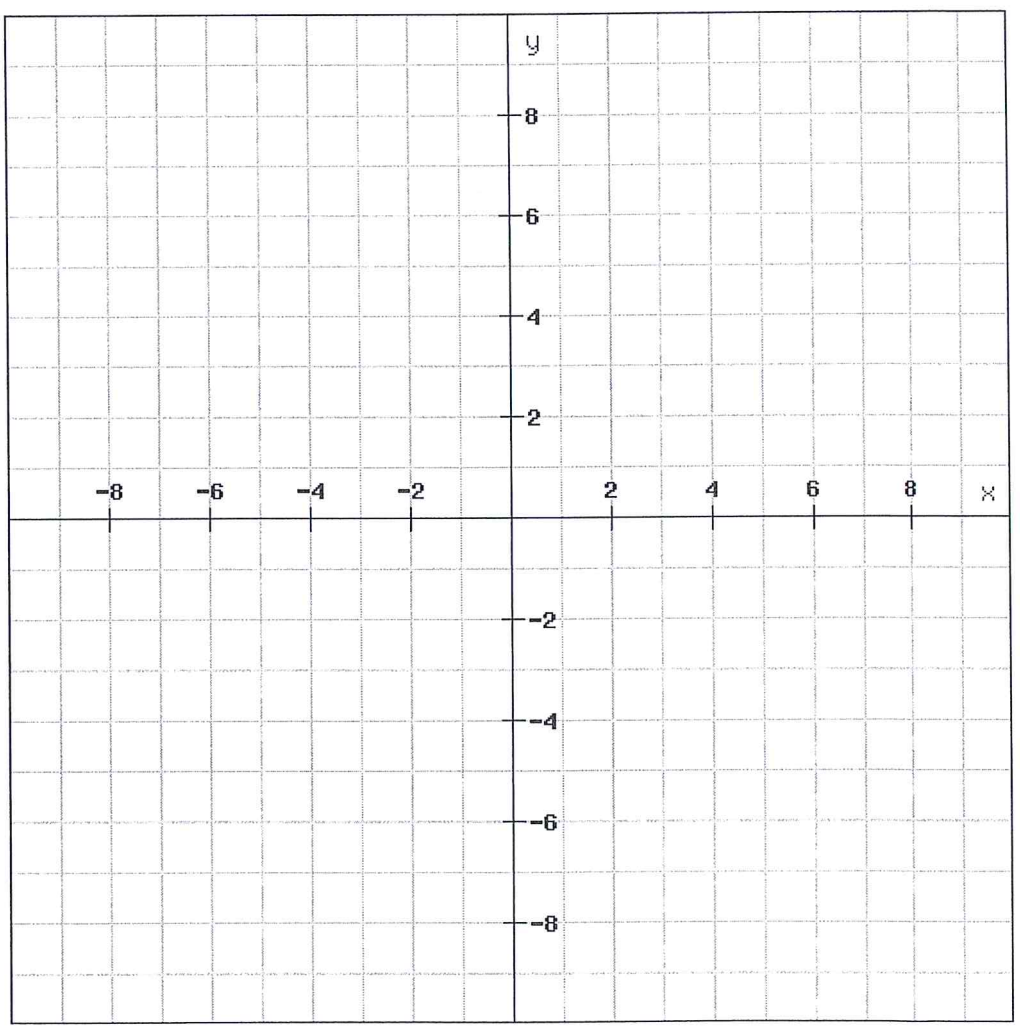
38. Write the equation of the line that is parallel to the line $y = -0.5x - 1$ and passes through the point $(-3, 6)$. Write its equation in the forms: $y = mx + b$ and $ax + by + c = 0$, $(a, b \in Z)$



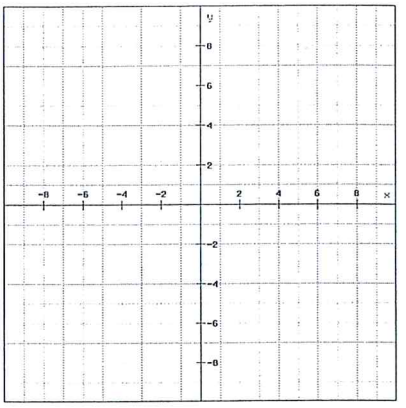
39. Sketch and write the equation of the line with a slope of $-\frac{1}{5}$ that passes through the point $(0,2)$.



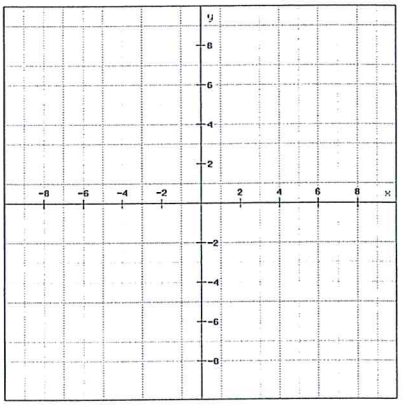
40. Sketch and write the equation of the lines with a slope: 1, 2, –3, –1, $-\frac{1}{2}, -\frac{1}{3}$, that pass through the point (0,0).



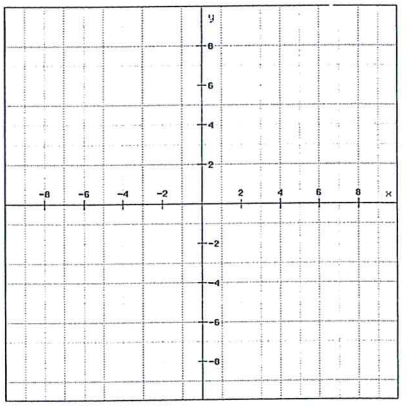
41. Sketch and write the equation of the line with a slope of –3 that passes through the point (0,–3).



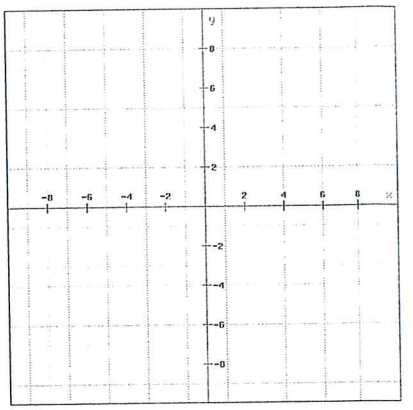
42. Sketch and write the equation of the line with a slope of 2 that passes through the point (2,0)



43. Sketch and write the equation of the line with a slope of $-\frac{1}{2}$ that passes through the point (–2,0)



44. Sketch and write the equation of the line with a slope of 2 that passes through the point (–4,2)

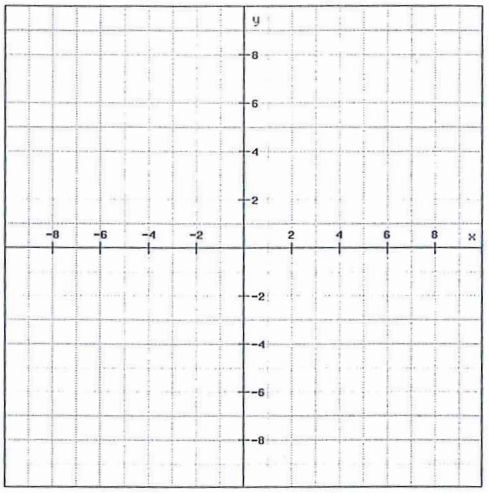


45. Find the intersection between the lines f(x) = 2x – 3 and f(x) = –5x –2

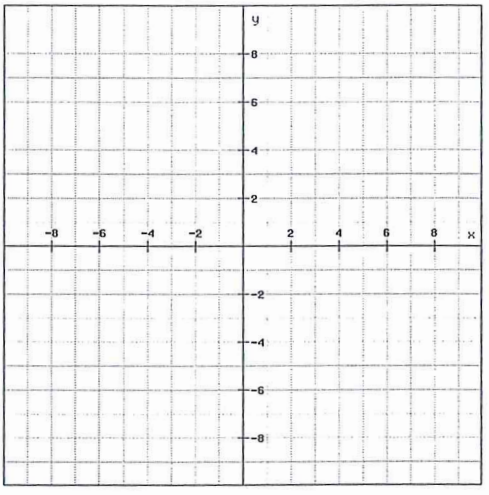
46. Find the intersection between the lines f(x) = –12x – 13 and f(x) = 15x +20.

DISTANCE AND MIDPOINT BETWEEN 2 POINTS

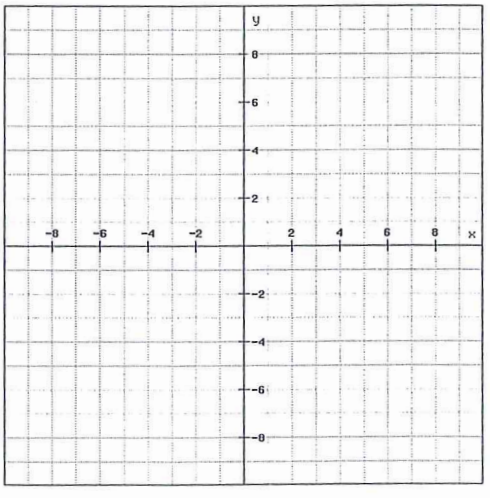
47. Given the points (1, 2) and (5, 8). Find the distance between them. Find the midpoint. Sketch to illustrate your answer.



48. Given the points (–3, 2) and (5, –6). Find the distance between them. Find the midpoint. Sketch to illustrate your answer.

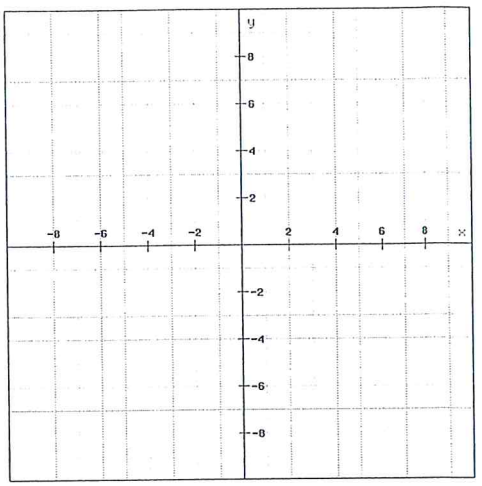


49. Given the points (–1, –6) and (–5, –1). Find the distance between them. Find the midpoint. Sketch to illustrate your answer.

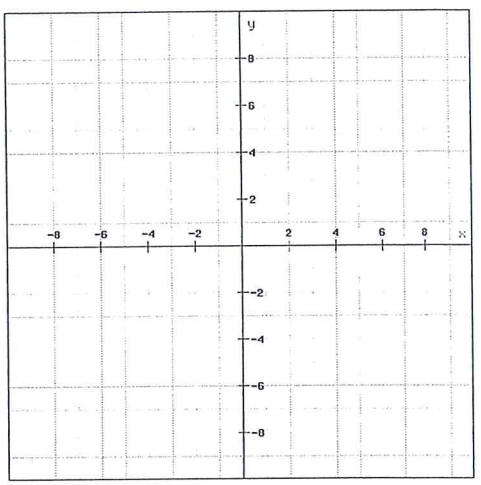


PERPENDICULAR LINES ($m\ m_{\perp} = -1$)

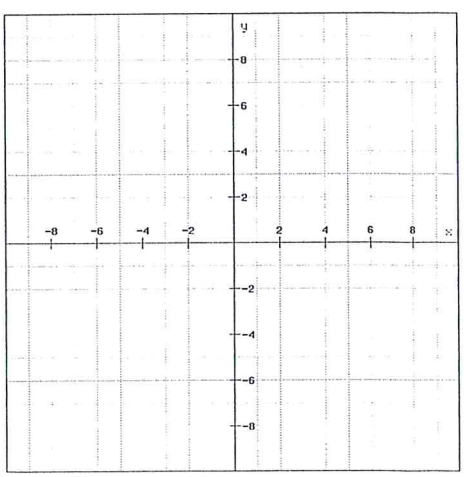
50. Find the equation of a line perpendicular to the line $y = 3x - 2$ that passes through the point (3, 12). Sketch to illustrate your answer.



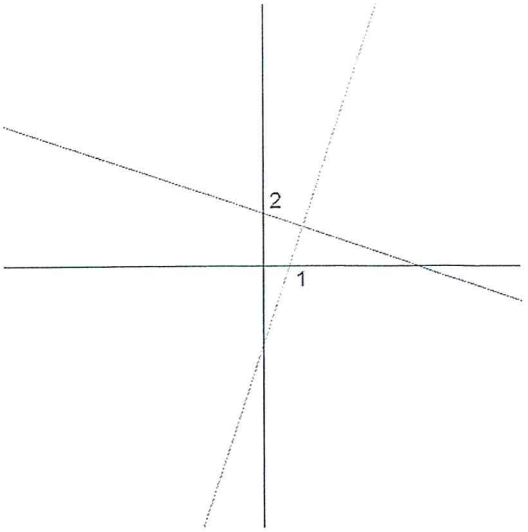
51. Find all the lines perpendicular to the line $y = -3x + 4$. Fin the ones that passes through the point (–3, 1). Sketch to illustrate your answer.



52. Find a line perpendicular to the line $y = -\frac{2}{5}x + 1$ that passes through the point (–1, –7). Sketch to illustrate your answer.

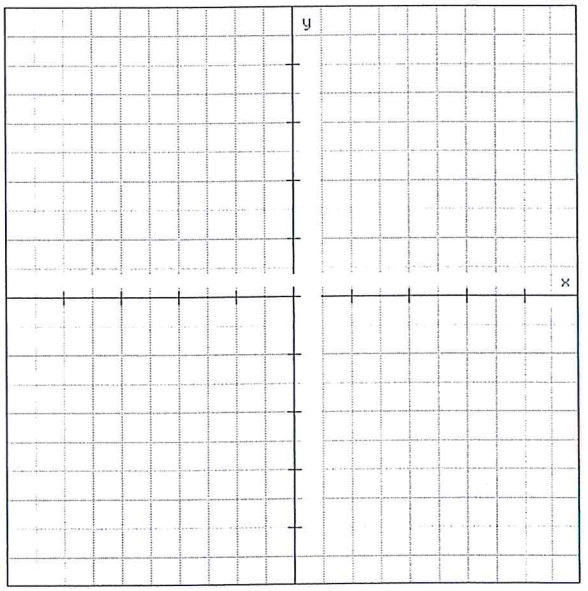


53. Given that the slope of one of the lines is 3 and that the lines are perpendicular, find the **exact** coordinates of the point of intersection of the two lines.



Application

1. The price of a new toy (in US$) is C(t) = 20 – 0.5t, t given in days.
   a. Sketch the corresponding graph.



   b. What was the initial price of the toy? _____

   c. Find the price of the toy after 10 days

   d. What is the domain of the function, argument the answer,

   e. What is the range of the function.

   f. What is the meaning of 0.5? Does it have units? What are they?

2. You need to rent a car for one day and to compare the charges of 3 different companies. Company I charges 20$ per day with additional cost of 0.20$ per mile. Company II charges 30$ per day with additional cost of 0.10$ per mile. Company III charges 60$ per day with no additional mileage charge.

   a. Write the cost function for each one of the companies.

   b. Sketch all 3 graphs on the same axes system.

   c. Comment on the circumstances in which renting a car from each one of the companies is best.

CHAPTER 4

4.1. – STATISTICS

In Statistics we try to obtain some conclusions by observing and/or analyzing data.

1. The set of objects that we are trying to study is called _____, the number of elements in the population can be _____ or _____.
2. Usually the _____ is too big and therefore we obtain a _____. This process is called _____.
3. We use the _____ to obtain conclusions about the _____.

Types of DATA

1. _____ data.
2. _____ data that can be divided to _____ or _____.
3. _____ can be counted while _____ data can be _____.
4. Give 3 examples of _____ data:

5. Give 3 examples of _____ _____ data:

6. Give 3 examples of _____ _____ data:

7. Given the following variables, classify them in the table:

- Eye color
- Shoe size
- Height
- Weight
- Number of cars in a parking lot
- Type of fruit
- Number of apples sold a day in a store
- Velocity of the wind
- Temperature
- Numbers of pages in a book
- Name of writer
- Number of students in a school

Categorical	Numerical Discrete	Numerical Continuous

8. In a certain class the eye color of students was studies. The following results were obtained:

   Brown, Black, Brown, Blue, Brown, Black, Brown, Blue, Brown, Blue, Brown, Black, Brown, Blue.

   a. How many students participated?
   b. Represent the information in a Bar Chart
   c. Represent the information in a Pie Chart

9. In a certain zoo the length of a certain type of animal (in meters) was studied. The following results were obtained:

   1.77, 1.60, 1.89, 1.54, 1.77, 1.65, 1.86, 1.51, 1.67, 1.94, 1.73, 1.70, 1.66, 1.58

   a. How many animals participated?
   b. Represent the information in a Bar Chart
   c. Represent the information in a Pie Chart

4. In a certain math class the following grades were obtained:

   65, 72, 85, 89, 52, 71, 89, 68, 63, 76, 61, 86, 98, 79, 79, 91, 74, 89, 77, 68, 78

   a. How many students participated?
   b. Represent the information in a Bar Chart
   c. Represent the information in a Pie Chart

4.2. – FREQUENCY DIAGRAMS

1. In a certain math class the following grades were obtained:

   68, 79, 75, 89, 54, 81, 88, 62, 67, 75, 64, 85, 97, 77, 79, 90, 75, 89, 76, 68

   a. State the number of elements in the set: _____

   b. What kind of data is this? _____

   c. Fill the table:

Grade	Mid – Grade (Mi)	Frequency (fi)	fi x Mi	Cumulative Frequency (Fi)	Fi (%)
51 – 60					
61 – 70					
71 – 80					
81 – 90					
91 – 100					
Total					

   d. Is this the only possible choice for the left column of the table? Why? Discuss the advantages and disadvantages of organizing information in such a way.

   e. Design a new table with a different _____

Grade	Mid – Grade (Mi)	Frequency (fi)	Fi x Mi	Cumulative Frequency (Fi)	Fi (%)

f. Obtain the mean in both cases:

g. State a formula for the mean:

h. The mean of the population is denoted with the Greek letter mu: _____ and typically it is _____. The mean of the sample is denoted by _____

i. State the mode of the set: _____

j. Find the modal interval in both cases:

k. Find the Median using the original data: _____

l. Find the median using the tables, discuss your answer.

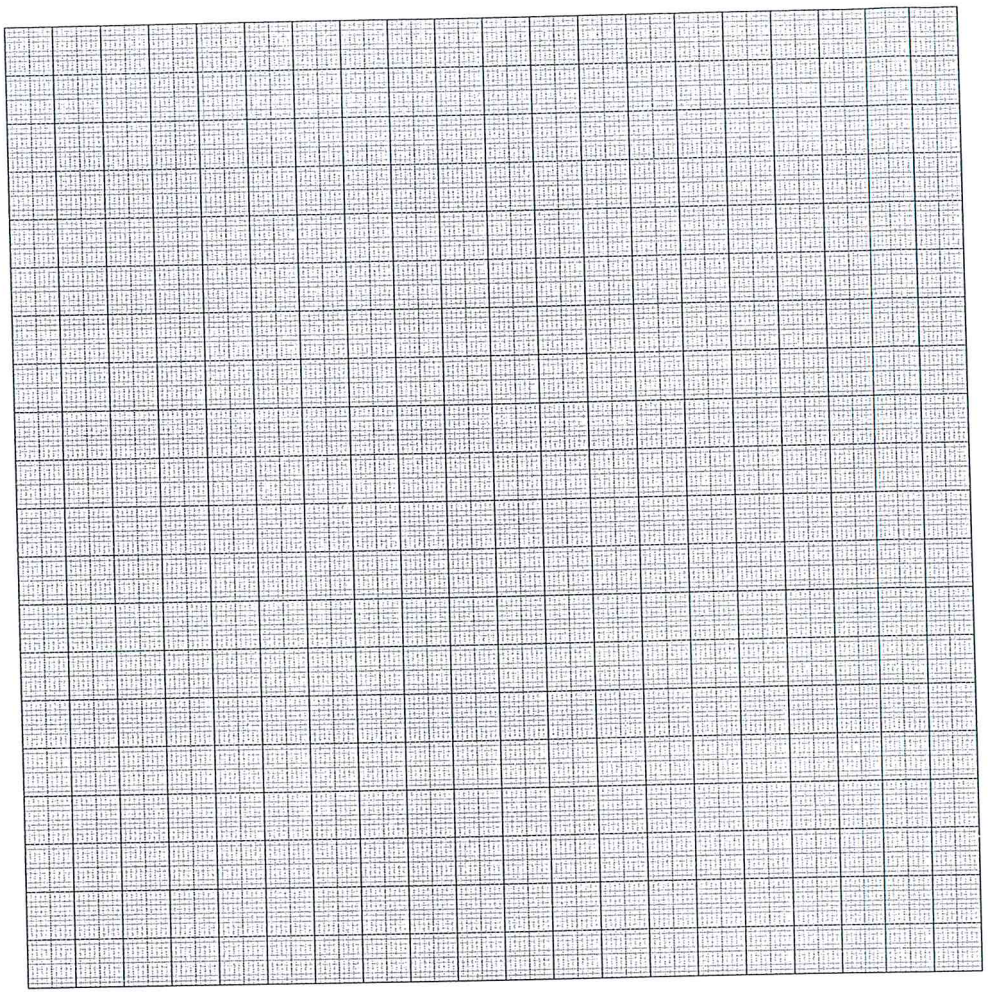
m. In general this method of organizing information is called _____

n. The 1st column is called _____ with upper interval boundary and _____ interval boundary.

o. The 2nd column is called _____

p. On the following grid paper sketch the corresponding points.

Cumulative frequency



Variable: _____

q. This graph is called cumulative frequency curve or _____

r. Find the median using the graph: _____

s. Find the first quartile (Q_1) using the graph: Q_1 = _____

t. Find the first quartile (Q_1) using the original data: Q_1 = _____

u. Find the third quartile (Q_3) using the graph: Q_3 = _____

v. Find the first quartile (Q_3) using the original data: Q_3 = _____

w. Find P_{30} using the graph: _____ Find P_{65} using the graph: _____

x. The Inter Quartile Range is in general _____ in this case it is _____

y. Find the answers to all the different parts using your GDC.

2. In a certain class the following heights (in m) of students were collected:

1.77, 1.60, 1.89, 1.54, 1.77, 1.65, 1.86, 1.51, 1.67, 1.94, 1.73, 1.70, 1.66

a. State the number of elements in the set: _____

b. What kind of data is this? _____

c. Fill the table:

Grade	Mid – Grade (Mi)	Frequency (fi)	fi x Mi	Cumulative Frequency (Fi)	Fi (%)
[1.50 – 1.60)					
[1.60 – 1.70)					
[1.70– 1.80)					
[1.80 – 1.90)					
[1.90 – 2.00)					
Total					

d. Obtain the mean: _____

e. State the mode of the set: _____

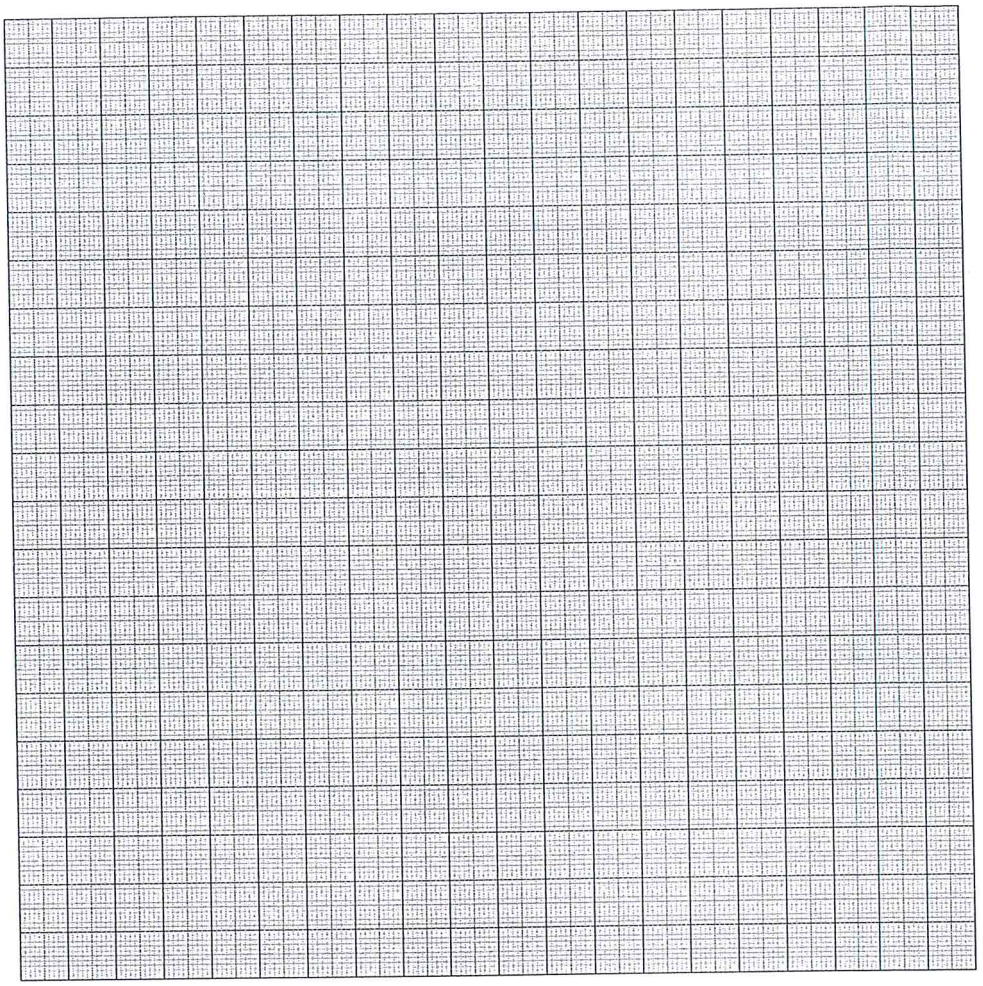
f. Find the modal interval: _____

g. Find the Median using the original data: _____

h. Find the median using the table, discuss your answer.

i. On the following grid paper sketch the corresponding points.

Cumulative frequency



Variable: _____

j. This graph is called cumulative frequency curve or _____

k. Find the median using the graph: _____

l. Find the first quartile (Q_1) using the graph: Q_1 = _____

m. Find the first quartile (Q_1) using the original data: Q_1 = _____

n. Find the third quartile (Q_3) using the graph: Q_3 = _____

o. Find the first quartile (Q_3) using the original data: Q_3 = _____

p. Find P_{20} using the graph: _____ Find P_{80} using the graph: _____

q. The Inter Quartile Range is in general _____ in this case it is_____

r. Find the answers to all the different parts using your GDC.

3. In a certain class students eye color was collected:

   Brown, Black, Brown, Blue, Brown, Blue, Green, Brown, Black, Green

   a. State the number of elements in the set: _____

   b. What kind of data is this? _____

   c. Fill the table:

Eye Color	Mid – Color (Mi)	Frequency (fi)	fi x Mi	Cumulative Frequency (Fi)	Fi (%)
Brown					
Blue					
Green					
Black					
Total					

   d. Obtain the mean: _____

   e. State the mode of the set: _____

   f. Find the modal interval: _____

   g. Find the Median using the original data: _____

   h. Find the median using the table, discuss your answer.

   i. Find the answers to all the different parts using your GDC.

   j. Represent the information in a histogram:

4.3. – PROBABILITY

Probability is the science of chance or likelihood of an event happening

If a random experiment is repeated ____ times in such a way that each of the trials is identical and independent, where n(A) is the number of _____ event A occurred,

then: Relative frequency of event A = P(A) = $\frac{n(A)}{N}$ $(N \to \infty)$

Exercises

1. In an unbiased coin what is P(head) ?

   This probability is called _____.

2. Explain the difference between theoretical probability and experimental probability.

3. Throw a drawing pin and fill the table:

	Fell pointing upwards 	Fell on its side 	Total number of throws
Number of events			
Probability			

4. The definition of probability ("***Laplace law***")is:

   P(A) = $\frac{Number}{Total}$ _____ / _____

Properties of probability

$0 \leq P(A) \leq$ ___

P(U) = ____

5. Given the sentence "Good morning everyone". Find the following probabilities in case the choices are being made in a random way:

   a. P(choosing a vowel) =

   b. P(choosing a "o") =

   c. P(choosing a "e") =

   d. P(choosing a "z") =

6. In case a student is chosen randomly in your classroom. Find the probability it's a girl.

7. Find the probability of getting a prime number sum on tossing 2 dice.

8. Find the probability of getting a sum of 17 on tossing 3 dice.

9. Find the probability of being left handed in your classroom.

10. Find the probability of obtaining a sum of 5 on tossing 2 dice.

11. Find the probability of obtaining 2 tails on tossing 2 coins.

12. Knowing that the sum of 2 dice is more than 5, find the probability it's 10

13. Find the probability that a 2 digit number divides by 3

14. Find the probability of choosing the letter b in the word probability

15. Find the probability of choosing a number that contains the digit 7 in the first hundred numbers (1 to 100).

16. Find the probability of choosing a number that contains only even digits in the first thousand numbers (1 to 1000).

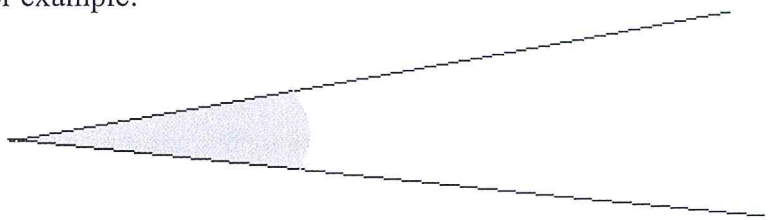
CHAPTER 5

5.1. – GEOMETRY

ANGLES

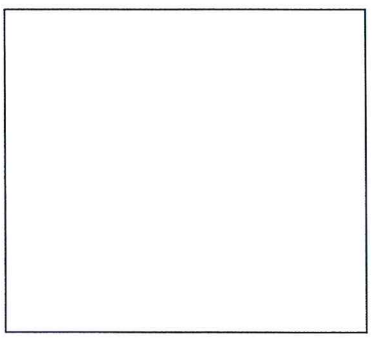
1. An angle is the figure formed by _____lines that start at a common point.

   For example:



   We say that the following angle has a size of _____ degrees or ____°

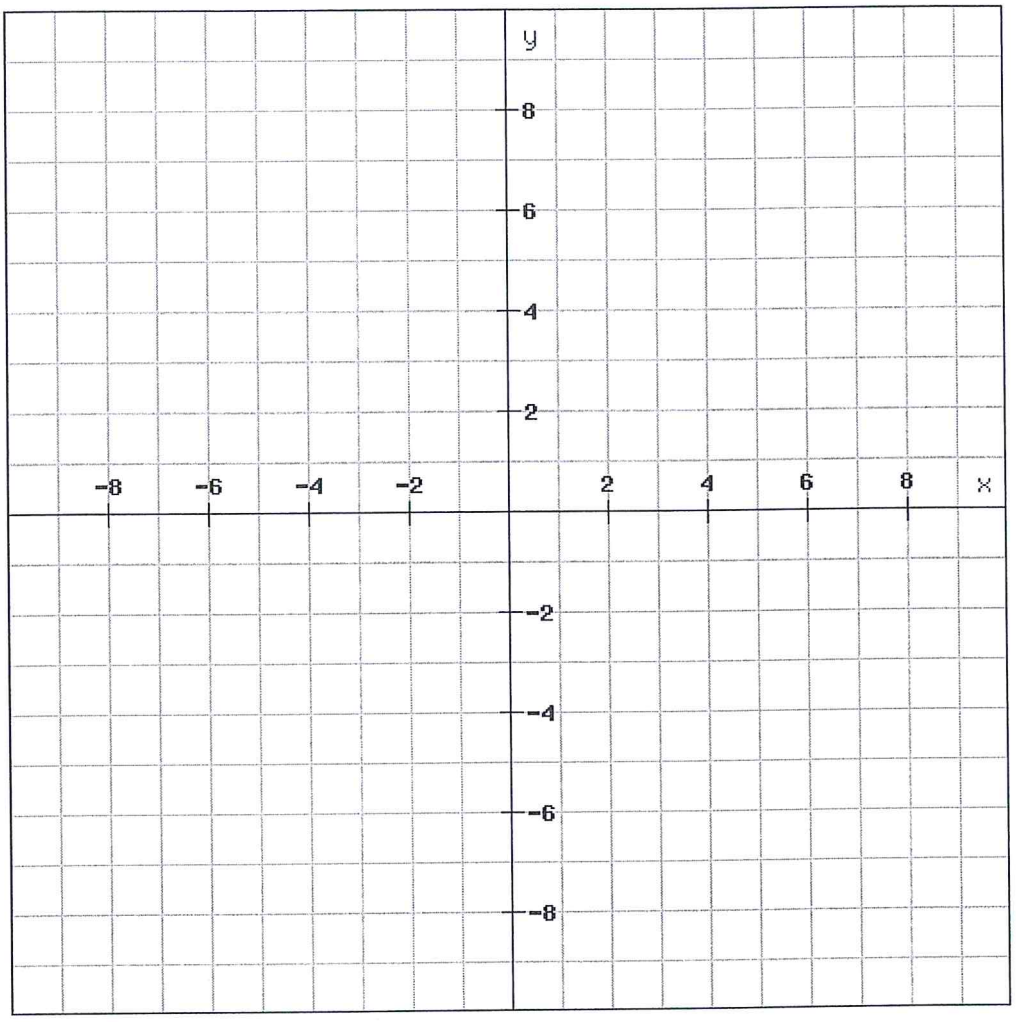
2. Use the following square to sketch an angle of 45° degrees:



POINTS

3. Indicate the following points on the plane:

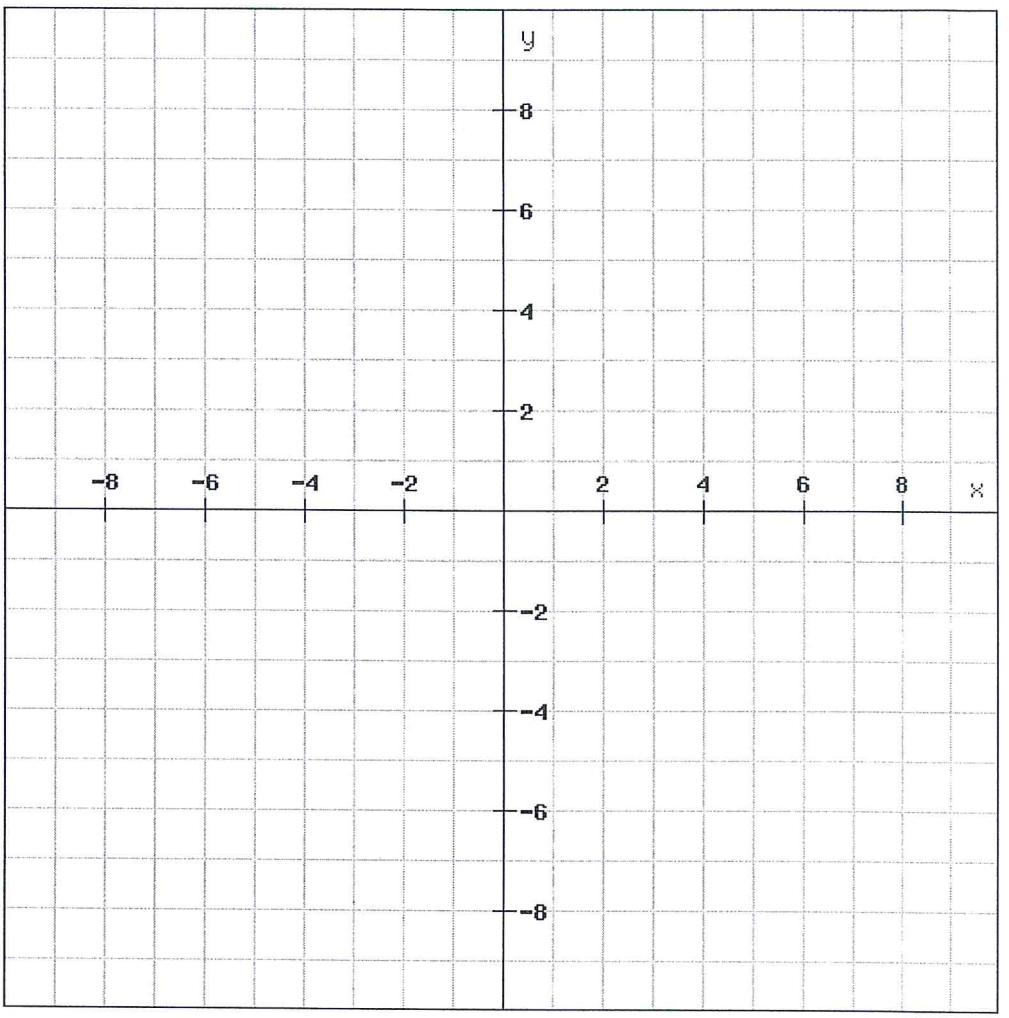
   A(1,5), B(–1, 4), C(–3, –7), D(6,–5), E(–1, –1), F(2, 0),G(0,–4), H(–4, 0)



LINES

4. Indicate the following points on the plane:

   A(0,0), B(1, 1), C(–2, –2), D(6,6)

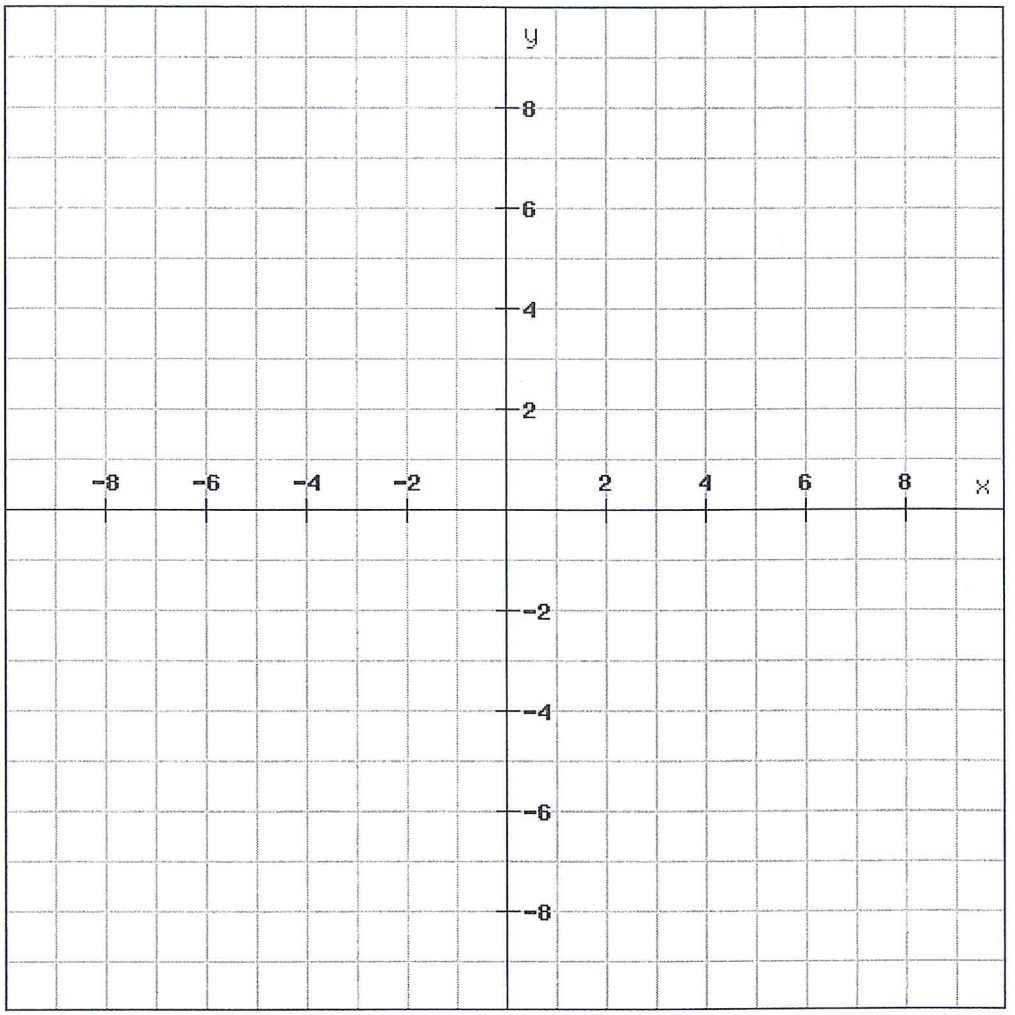


   a. What do these points have in common?

   b. Could you describe all the points that satisfy this property? How?

5. Indicate the following points on the plane:

A(0,0), B(1, 2), C(–2, –4), D(4,8)



a. What do these points have in common? Use a ruler to draw the line that connects them.

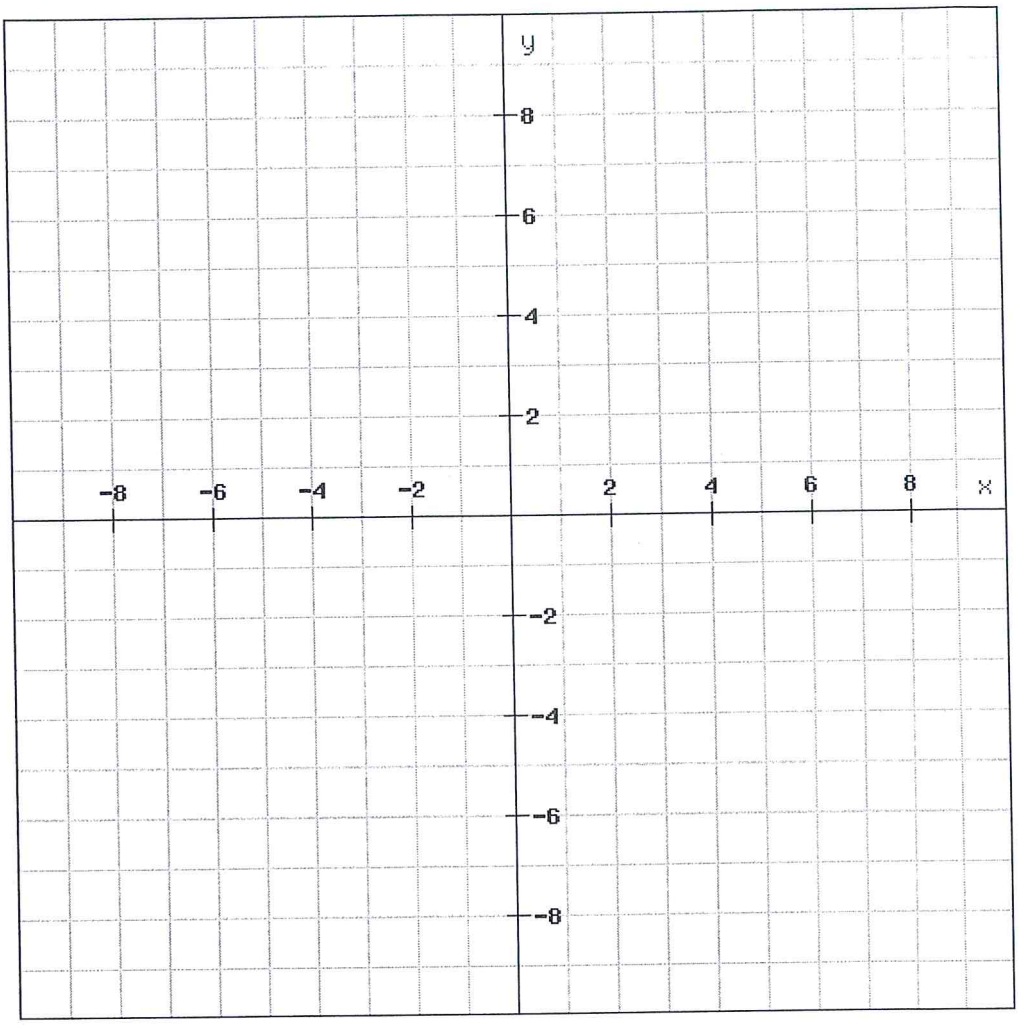
b. Could you describe all the points that satisfy this property? How?

c. On the same graph sketch the following points E(0,1), F(1, 3), G(–2, –3), H(4,9)

d. What do these points have in common? Use a ruler to draw the line that connects them. What is the relation between this line and the previous line?

6. Indicate the following points on the plane:

A(0, –2), B(1, 1), C(2, 4), D(–2,–8)



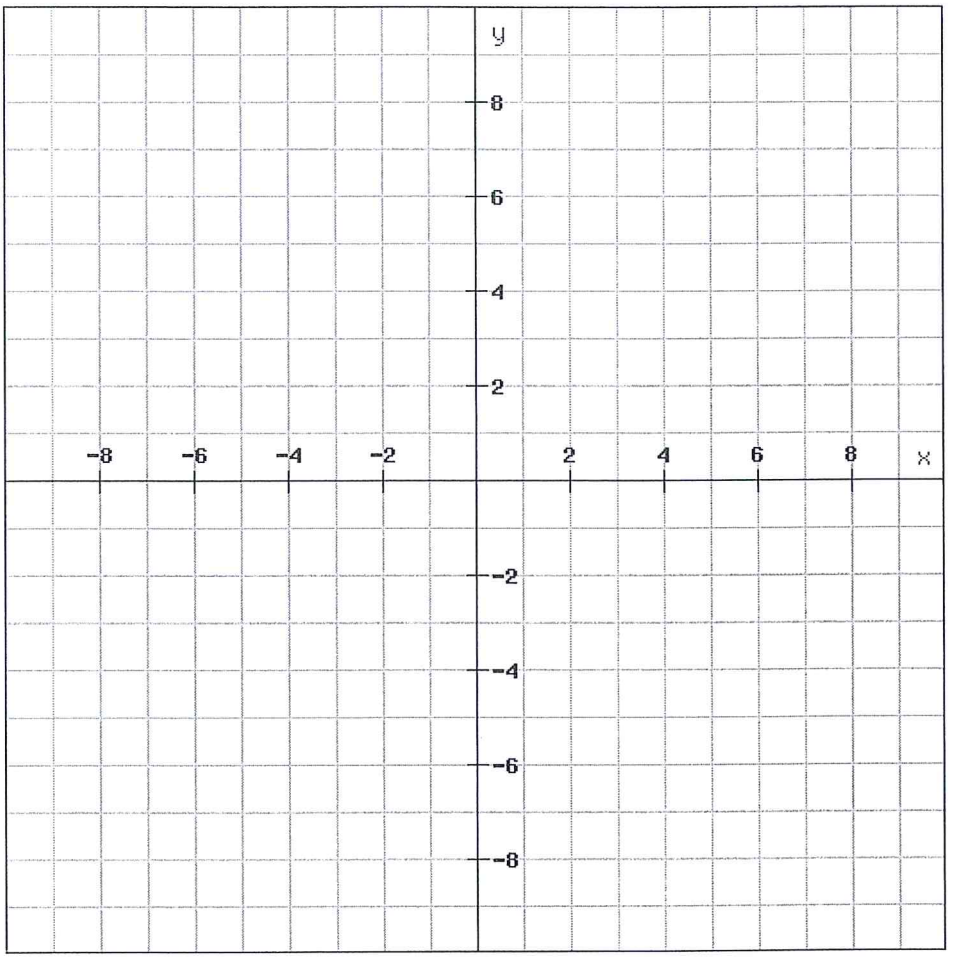
a. What do these points have in common? Use a ruler to draw the line that connects them.

b. Could you describe all the points that satisfy this property? How?

c. On the same graph sketch the following points E(0,1), F(1, 4), G(–2, –5), H(2, 7)

d. What do these points have in common? Use a ruler to draw the line that connects them. What is the relation between this line and the previous line?

7. Indicate the following points on the plane: A(0, 6), B(6, 0), C(0, 0)



a. Use a ruler to draw the line that connects each pair of points to form a triangle.

b. Find all the angles of the triangles you can.

c. This kind of triangle is called _____ and _____

d. Write down the lengths of the 2 equal sides: _____

e. Write down the Pythagorean Theorem: _____.

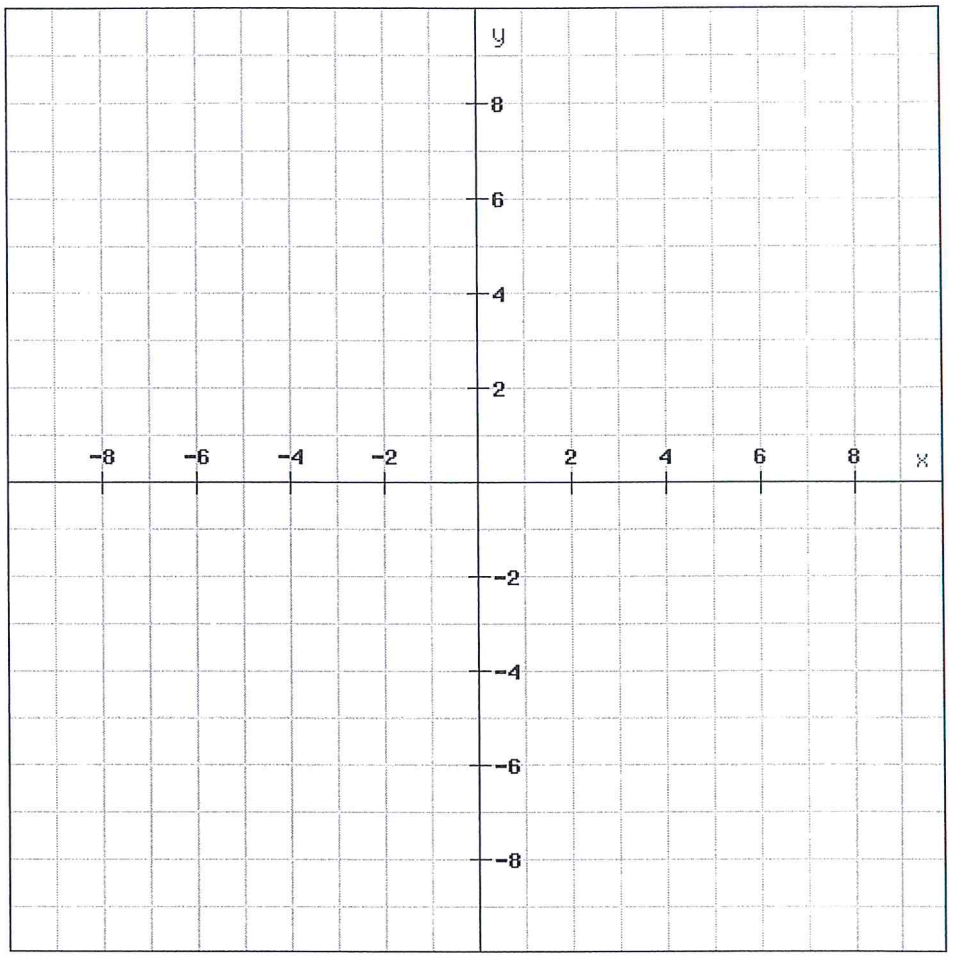
This theorem is only true in _____ triangles.

f. Use P. Theorem to find the length of the third side of the triangle.

g. Add the point D(6, 6) to the graph. The form ABCD is a _____. The area of this shape is _____

h. Use the area of the square to find the area of the triangle.

8. Indicate the following points on the plane: A(–4, 0), B(2, 6), C(8, 0)



a. Use a ruler to draw the line that connects each pair of points to form a triangle.

b. This kind of triangle is called _____

c. Write down the Pythagorean Theorem: _____.

This theorem is only true in _____ triangles.

d. Add the point D (2, 0) to the graph. The triangle ABD is _____.

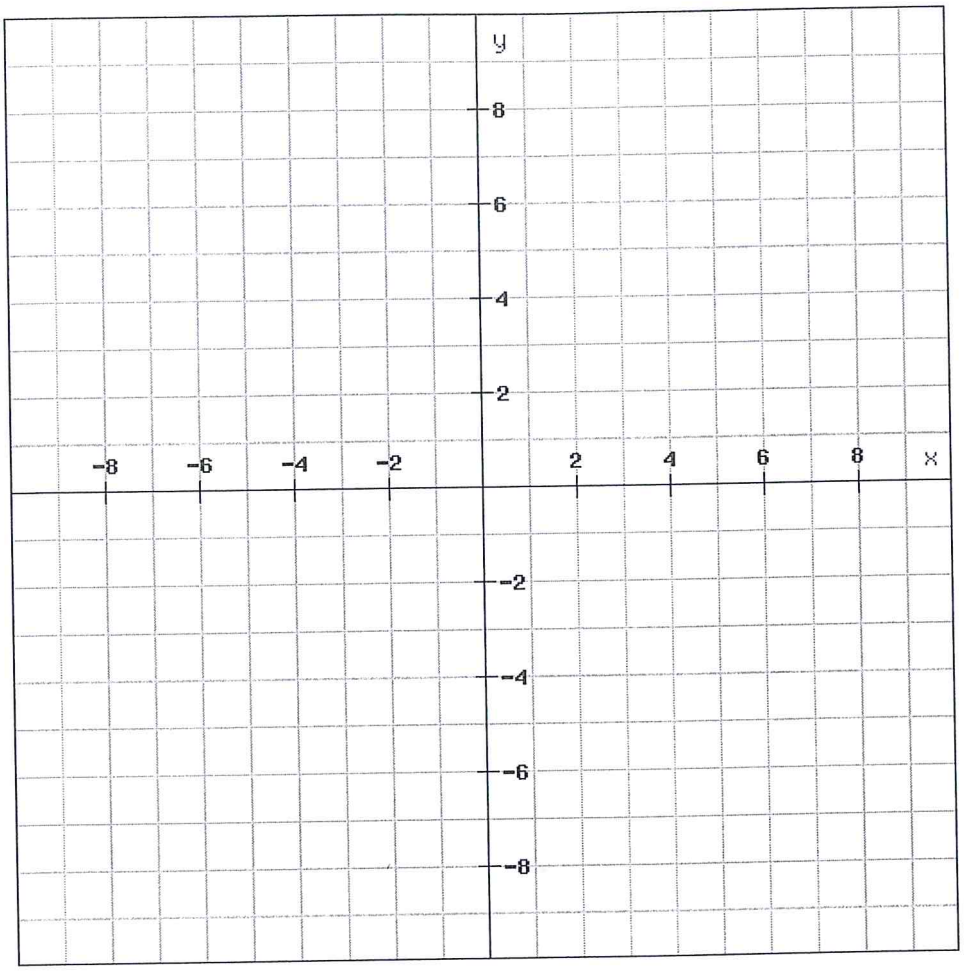
e. The length of AD is _____. The Length of BD is _____. Use P. Theorem to find the length of AB.

f. In consequence state the length of BC:_____.

g. The perimeter of the triangle ABC is _____

h. Add the point E (–4, 6) to the graph. The shape AEBD is a _____. The area of this shape is ___. Use this area to find the area of the triangle ABD and ABC.

9. Indicate the following points on the plane: A(–6, 0), B(3, 6), C(5, 0)



a. Use a ruler to draw the line that connects each pair of points to form a triangle.

b. Is this triangle isosceles or right angled?

c. Add the points D (–6, 6) and E (5, 6) to the graph. The shape ADEC is a _____

The area of this shape is _____.

d. Add the point F (3, 0) to graph and use the corresponding theorem to find the

length of AB: _____ and BC _____.

e. The perimeter of the triangle ABC is _____

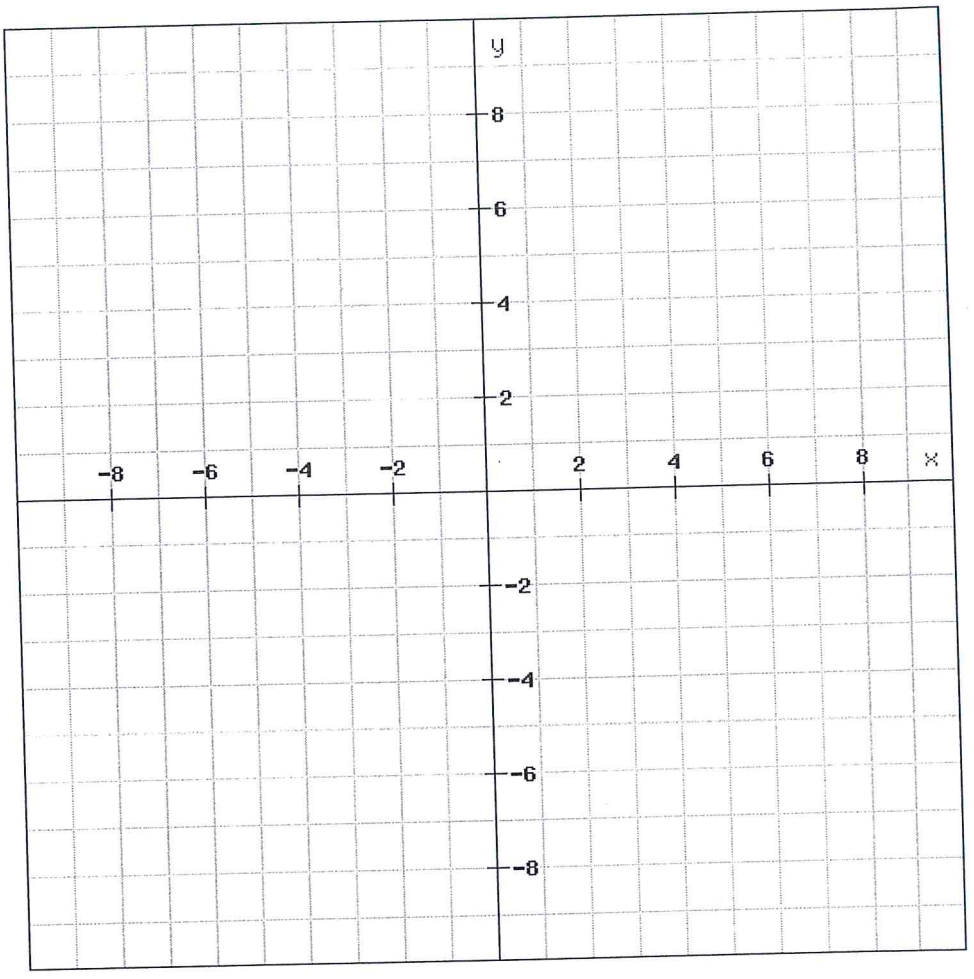
f. The line BF is called the _____ of the triangle.

g. Every triangle has ____ heights. A height is a lines that starts at a _____

and ends at _____ forming an angle of _____ with it.

h. Find the area of the triangles ABF, FBC and ABC.

10. Indicate the following points on the plane: A (–5, 0), B (5, 0), C (0, $\sqrt{75}$)



a. Use a ruler to draw the line that connects each pair of points to form a triangle.

b. Add the points D (0, 0) to the graph and use the corresponding theorem to find length of AB: _____ and BC _____.

c. What kind of triangle is this? _____

d. What can you say about the angles of this triangle?

e. The perimeter of the triangle ABC is _____

f. Find the area of the triangle ABC.

11. Define and sketch an example, include all the angles and lengths of sides in your example.

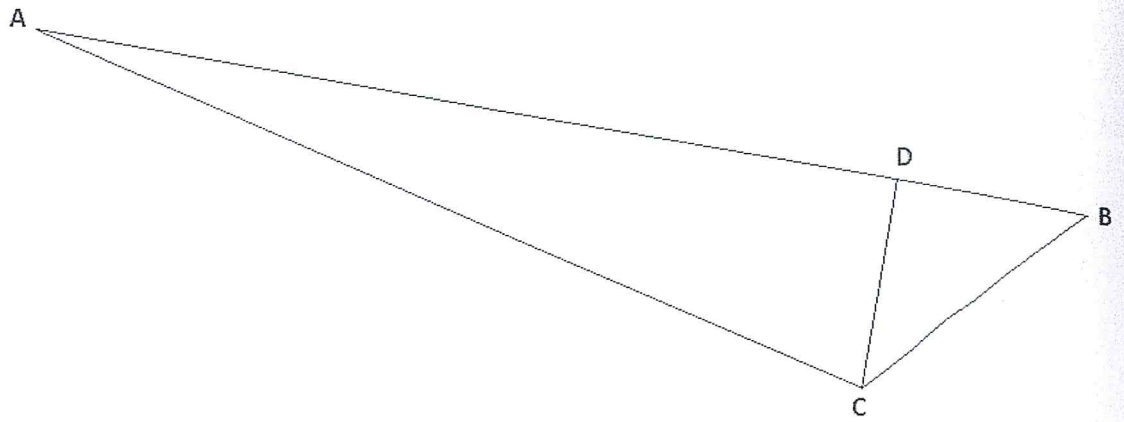
a. Equilateral triangle:

b. Isosceles triangle:

c. Right angled triangle:

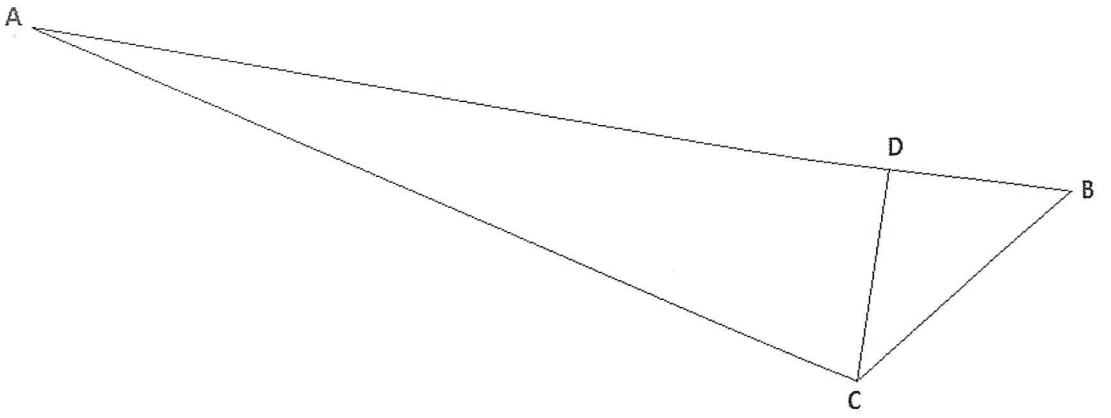
d. Right angled and isosceles triangle:

12. Given the following triangle, it is known that AB = 10cm, AD = 7cm and DC = 4cm. Angle CDB = 90°. Find:



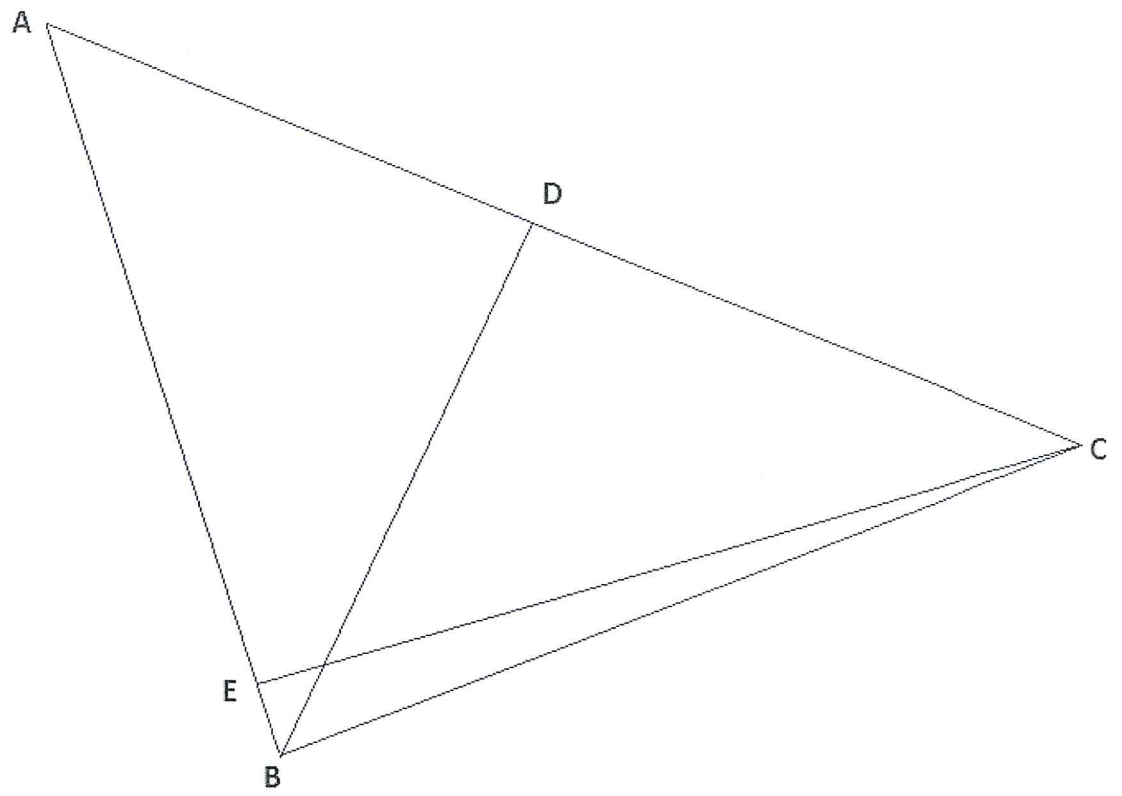
a. The lengths of BC and AC.
b. The area of ABC.
c. The perimeter of ABC

13. Given the following triangle, it is known that AC = 13cm, DB = 4cm and DC = 5cm. Angle CDB = 90°. Find:



a. The lengths of AD and BC.
b. The area of DCB.
c. The perimeter of ABC

14. Given the following triangle, it is known that AC = 20cm, DB = 10cm and DC = 11 cm. Angle CDB = 90° and angle CEA = 90°. Find:



a. The lengths of BC and AB.
b. The area of ABC.
c. The perimeter of ABC
d. What do EC and BD have in common?
e. The lengths of EC, EB and AE

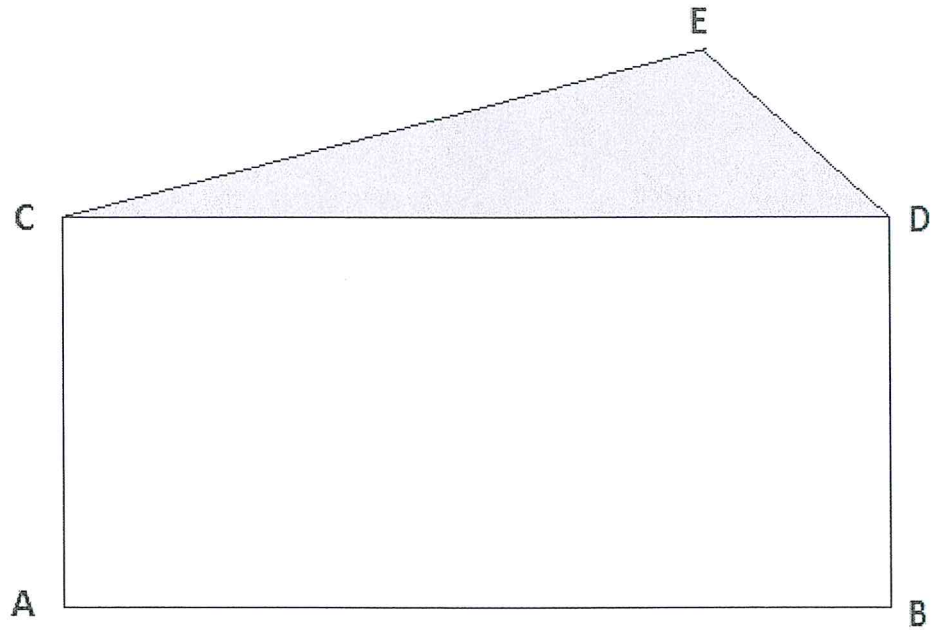
15. Given a right angled isosceles triangle whose longest side is 10 cm long.

a. Sketch the triangle.
b. Find the perimeter of the triangle.
c. Find the area of the triangle.

16. Given a right angled isosceles triangle whose smallest side is X cm long.

a. Sketch the triangle.
b. Find the perimeter of the triangle in terms of X.
c. Find the area of the triangle in terms of X.

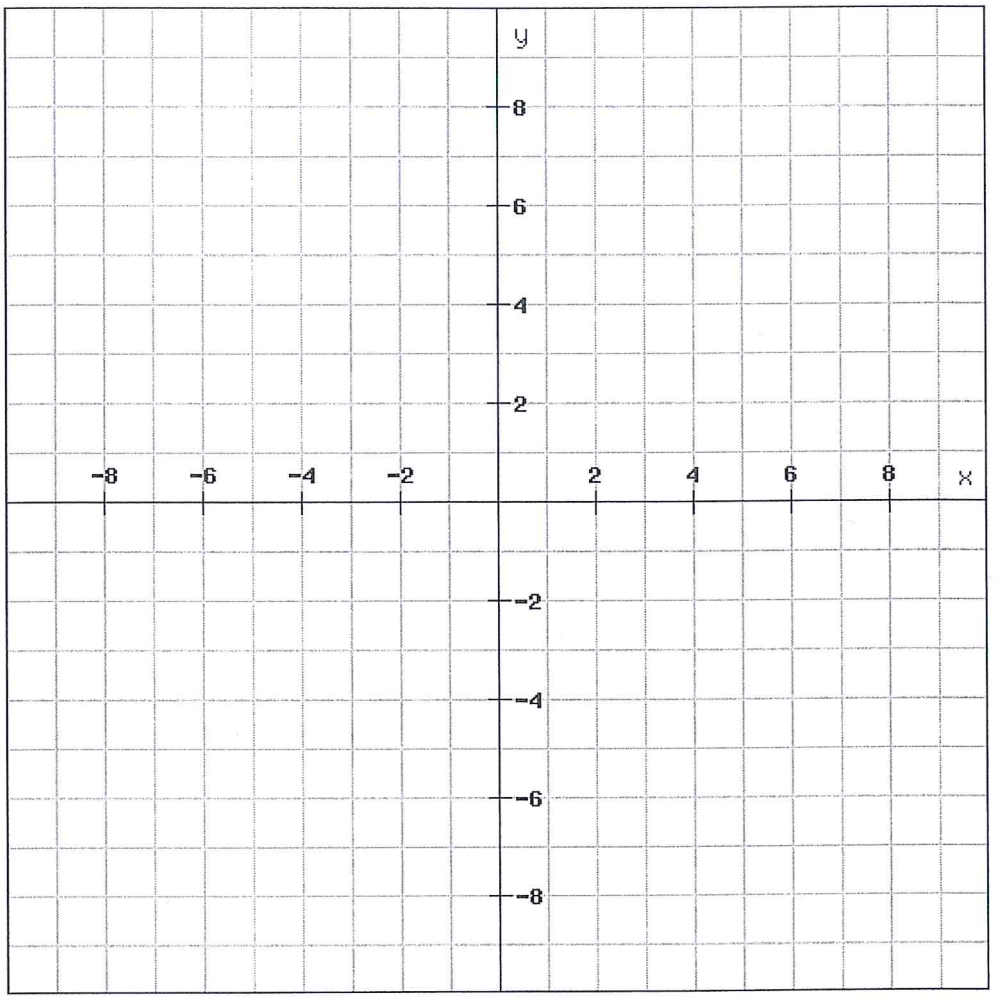
17. Given the facade of a certain house, it is known that AC = 4m, CD = 2AC, CE = 7m DE = 3m. ABCD is a rectangle. Find:



a. The height of the house above ground (help: lower a height from E).
b. The area of the entire facade.

18. Indicate the following points on the plane:

A(2,3), B(6, 9), C(–3, –7), D(6,–5)



a. Add the point (6, 3) and use Pythagorean theorem to find the distance between the points A and B.

b. Add the point (–3,–5) and use Pythagorean theorem to find the distance between the points C and D.

c. Find the distance AC

d. Find the midpoint between AB (help: the midpoint x coordinate is the "average" of the x coordinates and the y coordinate is the "average of the y coordinates)

e. Find the midpoint between CD

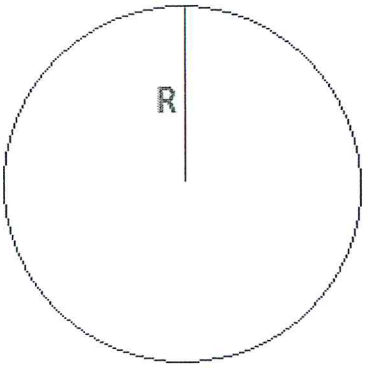
f. Find the midpoint between AC

CIRCLES

19. Given a circle with radius R, find

The Perimeter of the circle: _____

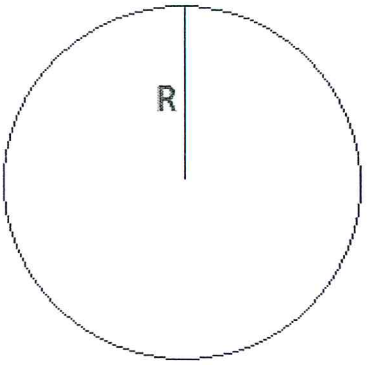
The Area of the circle: _____



20. Given a circle with radius 5cm, find

The Perimeter of the circle: _____

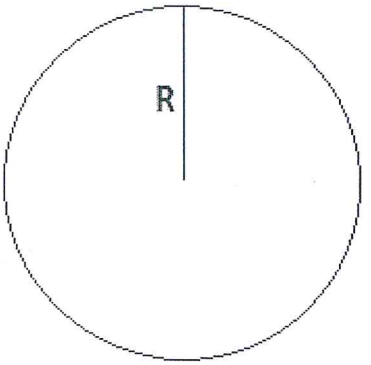
The Area of the circle: _____



21. Given a circle with perimeter 20π cm, find

The radius of the circle: _____

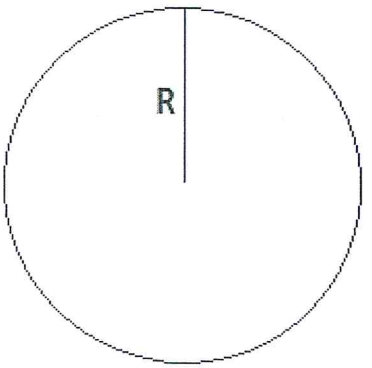
The Area of the circle: _____



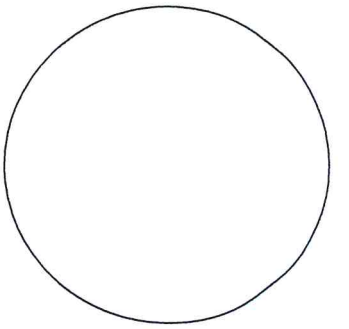
22. Given a circle with area 16π cm^2, find

The radius of the circle: _____

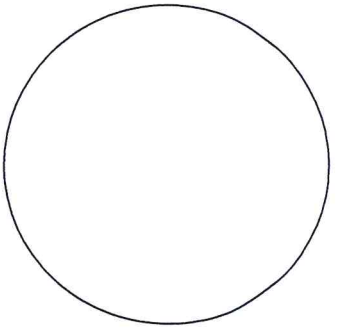
The perimeter of the circle: _____



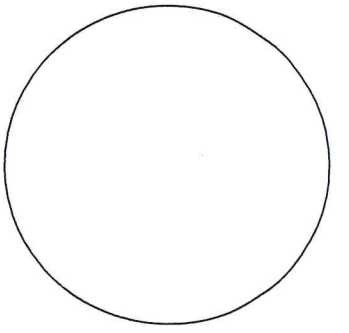
23. Shade 10% of the figure, find the corresponding angle:



24. Given that R = 5 cm. Shade 20% of the figure, find the corresponding angle and the area shaded.

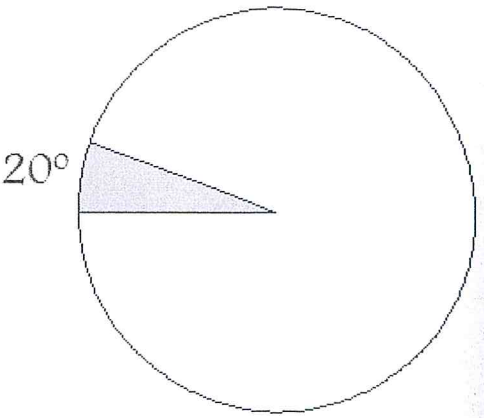


25. Given that R = 15 cm. Shade 30% of the figure, write the corresponding angle and find the area shaded.



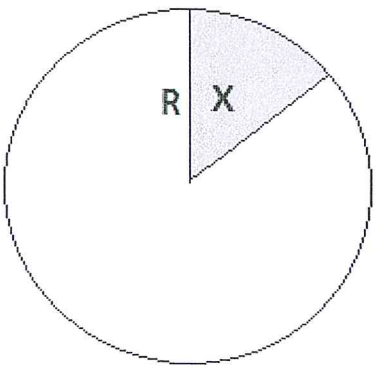
26. Given a circle with radius 10cm:

a. Find the percentage of the area shaded.
b. Find the size of the shaded area.
c. Find the perimeter of the shaded area.



27. Given a circle with radius 10cm:

a. Find the percentage of the shaded area of the total area of the circle in terms of the angel x.
b. Find the size of the shaded area in terms of x.
c. Find the perimeter of the shaded area in terms of x.

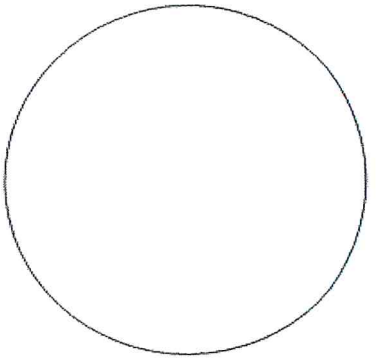


28. The length of the perimeter of a circle with radius r is _____. The length of the arc that corresponds an angle x° is _____. In case the angle x is measured in radians it would be _____.

The area of a circle with radius r is _____. The area of the sector that corresponds an angle x° is _____. In case the angle x is measured in radians it would be _____.

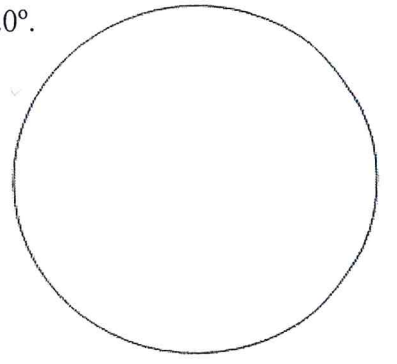
29. Given the circle with r = 2cm :

a. Show the arc corresponding an angle of 45°.
b. Calculate its length.
c. Shade the corresponding sector area.
d. Calculate it.



30. Given the circle with r = 3.2m:

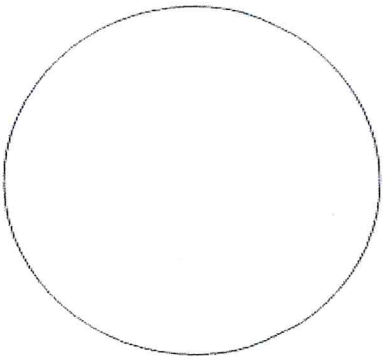
a. Show Shade the arc corresponding an angle of 20°.
b. Calculate its length.
c. Shade the corresponding sector area.
d. Calculate it.



31. Given the circle with r = 3m:

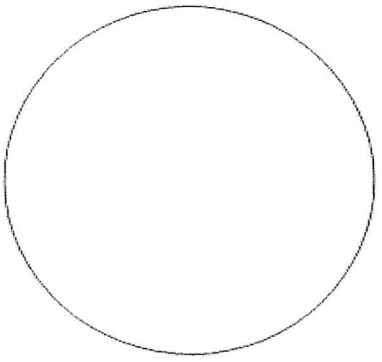
a. Show Shade the arc corresponding an angle of $\frac{\pi}{10} rad$.

b. Calculate its length.
c. Calculate its perimeter.
d. Shade the corresponding sector area.
e. Calculate it.

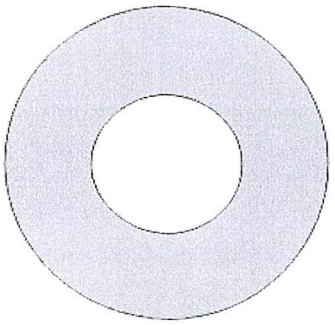


32. Given the circle with r = 6m:

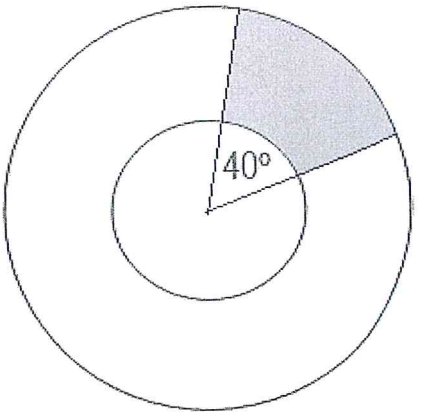
a. Show Shade the arc corresponding an angle of 1 radian.
b. Calculate its length.
c. Shade the corresponding sector area.
d. Calculate it.



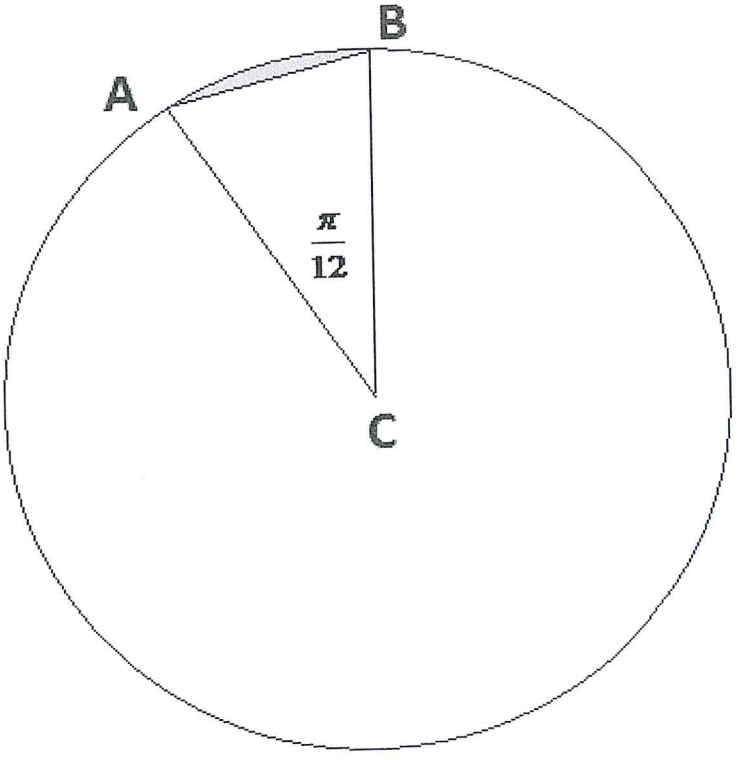
33. Given the following concentric circles with radii 3 cm and 5 cm correspondingly. Find the shaded area.



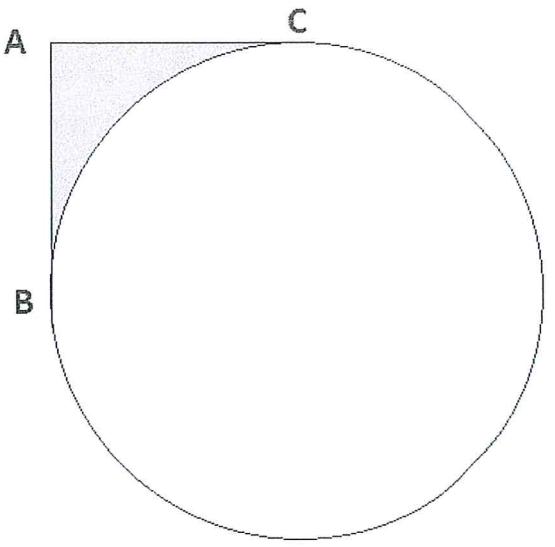
34. Given the following concentric circles with radii 10m and 14m correspondingly. Calculate the shaded area.



35. Given the following circle, AB is a chord on a circle with radius 10cm Calculate the shaded area.

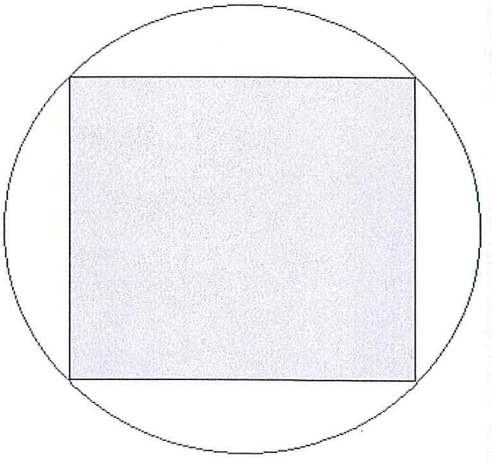


36. Given a circle with radius 8 cm. The segments AB and AC are tangent to the circle. Find the shaded area.



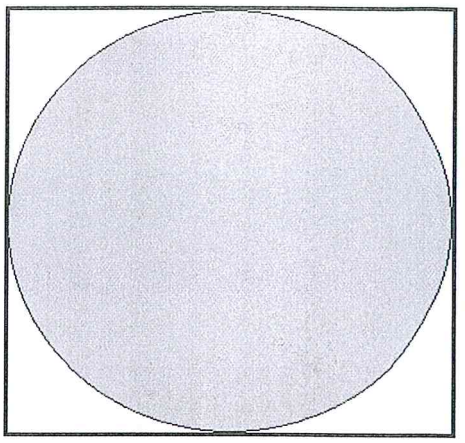
37. Given a circle with radius 10cm in which a square is circumscribed

a. Find the length of the side of the square.
b. Find the area of the square.
c. Find the area of the circle
d. Find the percentage of the area of the circle that the square occupies.



38. Given a circle with radius 10cm circumscribed in a square:

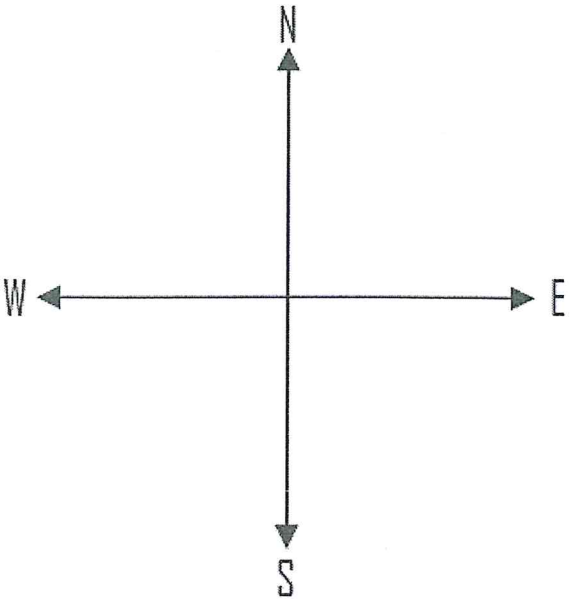
a. Find the length of the side of the square.
b. Find the area of the square.
c. Find the area of the circle
d. Find the percentage of the area of the square that the circle occupies.



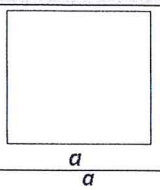
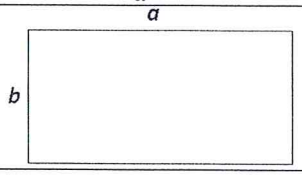
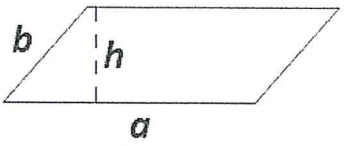
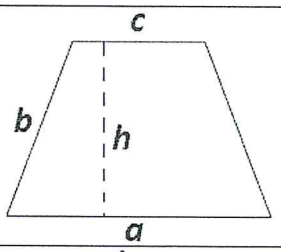
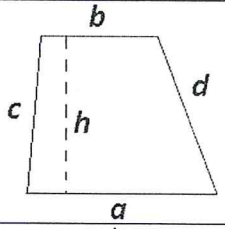
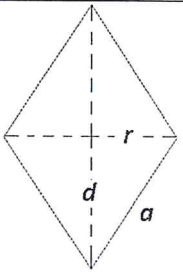
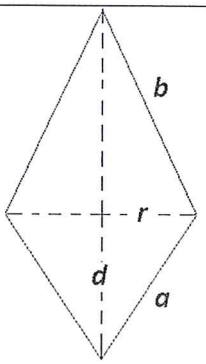
39. On the following diagram sketch the following directions:

a. N
b. N30°E
c. N45°E
d. E45°N
e. S10°W
f. W80°S
g. W20°N
h. N30°W

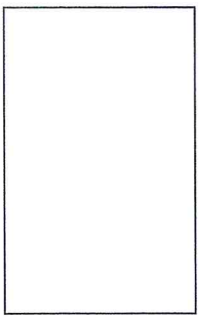
State a conclusion about the "uniqueness" of a direction.



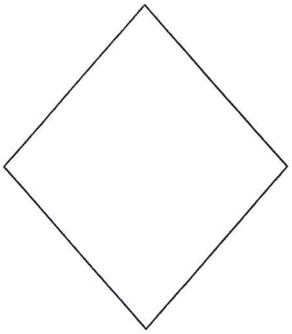
40. Given the following table, fill the blank using *a, b, c, d, h, r*

	Shape	Area	Perimeter
Square			
Rectangle			
Parallelogram			
Isosceles Trapezoid			
Trapezpezoid			
Rhombus			
Kite			

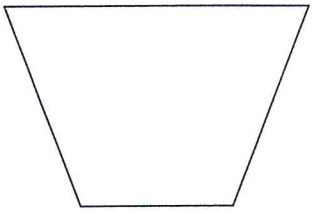
41. Given the following quadrilaterals. Write the name of each one of them:



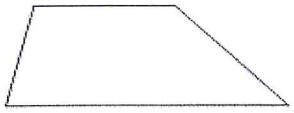
_____



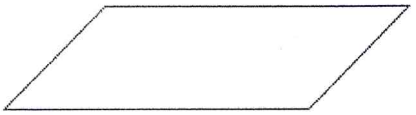
_____



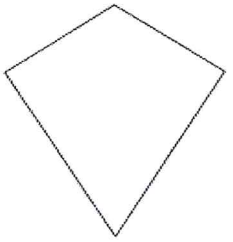
_____



_____



_____



_____

42. Given the following table, fill the blanks with yes or no.

	Shape (sketch)	Only 1 pair of parallel sides	2 pairs of parallel sides	1 pair of equal sides	2 pairs of equal sides	4 equal sides
Square						
Rectangle						
Parallelogram						
Isosceles Trapezoid						
Trapezpezoid						
Rhombus						
Kite						

43. True or False

a. A square is also a parallelogram True / False

b. A square is also a rectangle True / False

c. A square is also a trapezoid True / False

d. A parallelogram is also a square True / False

e. A rectangle is also a square True / False

f. A rhombus is always a parallelogram True / False

g. A parallelogram is always r rhombus True / False

h. A parallelogram is sometimes a rhombus True / False

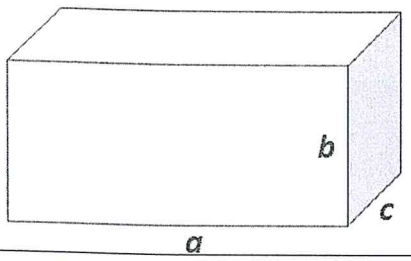
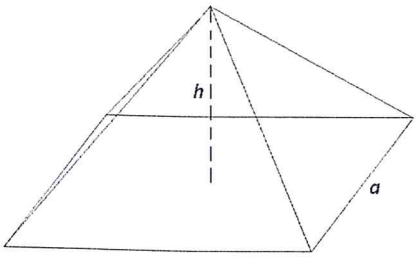
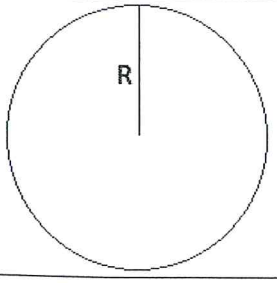
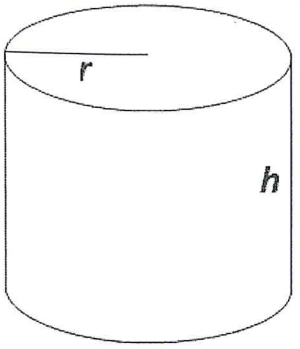
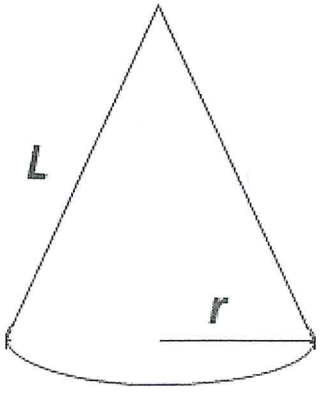
i. A rhombus is always a kite True / False

j. All the shapes above mentioned are quadrilaterals True / False

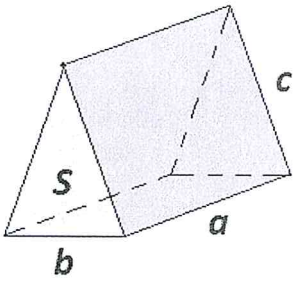
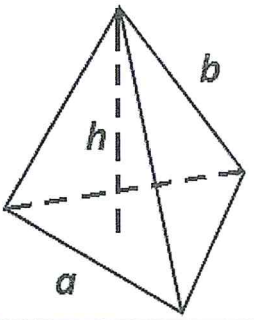
44. Given the following table, fill the blanks with yes or no.

	Shape (Sketch diagonals as well)	Diagonals are perpendicular	Diagonals are equal	Diagonals bisect angle	Diagonals bisect each other
Square					
Rectangle					
Paralleogram					
Isosceles Trapezoid					
Trapezpezoid					
Rhombus					
Kite					

45. Given the following table, fill the blanks

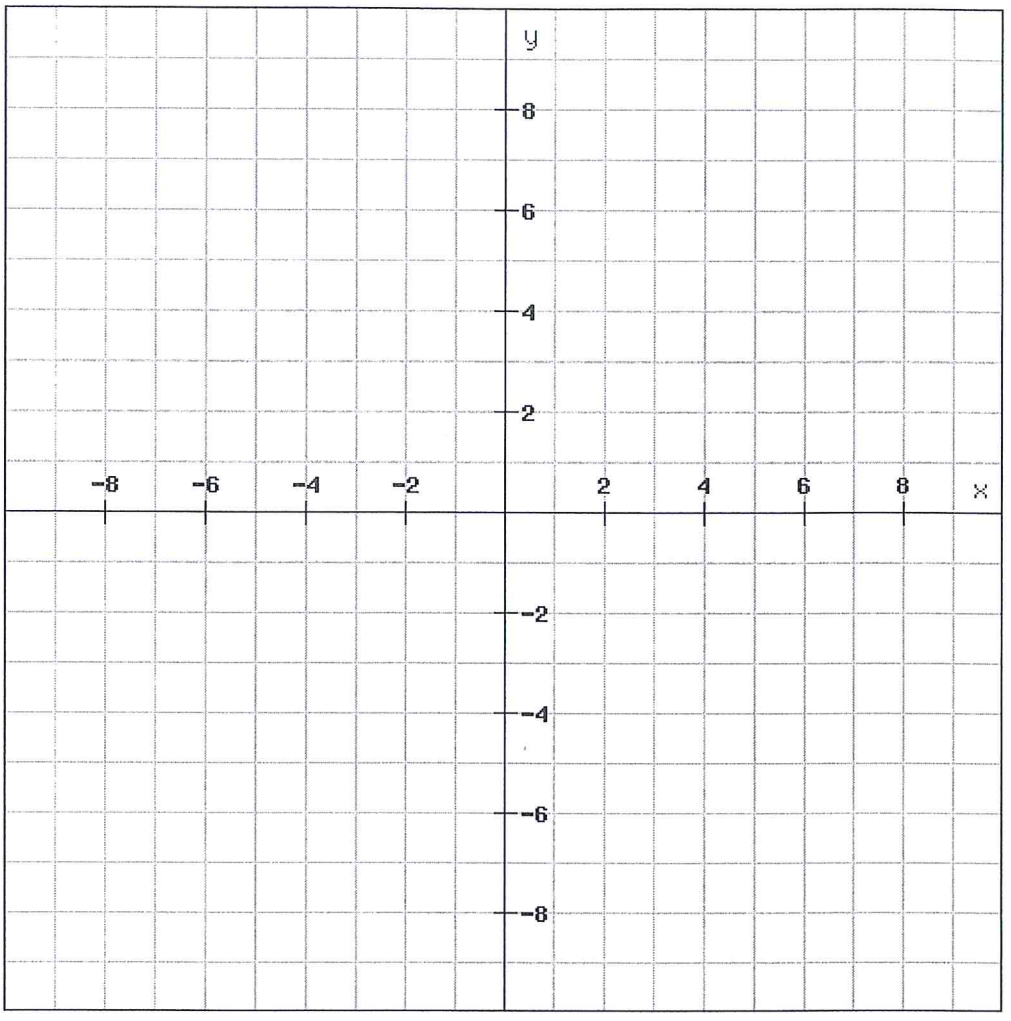
	Shape	Surface Area	Volume
Cuboid (Rectangular Prism)			
Pyramid (Square based)			
Sphere			
Cylinder			
Cone			

46. Given the following table, fill the blanks

	Shape	Surface Area	Volume
Triangular prism			
Triangle based Pyramid (Tetrahedron)			

5.2. – GEOMETRIC TRANSOFRMATIONS

1. Indicate the following points on the plane: A(0,0), B(–1,6),C(4,2). Connect them to form a triangle.

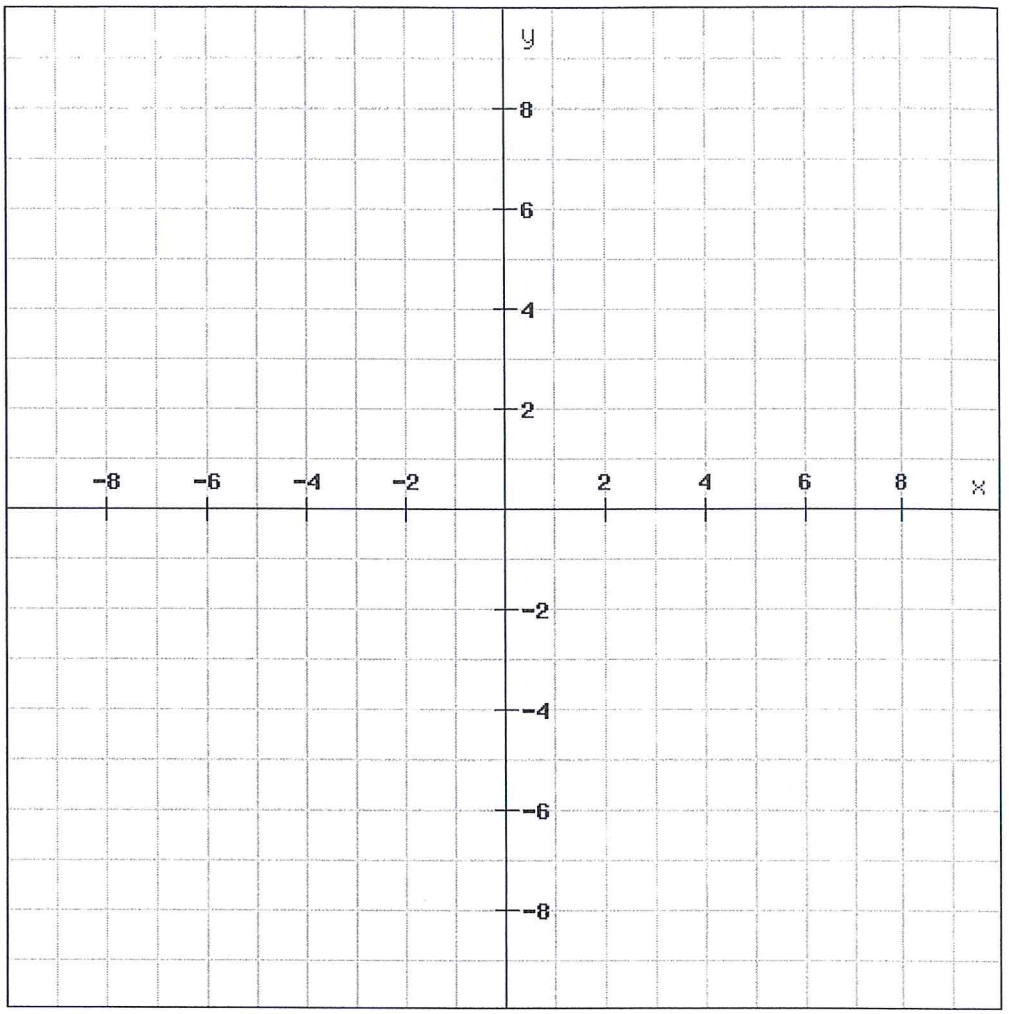


a. Indicate the following points on the plane: A'(0,–3), B'(–1,3),C'(4,–1), Connect them to form a triangle.

b. What can you say about the location of the 2nd triangle in comparison to the first one?

c. This is a _____ translation.

2. Indicate the following points on the plane: A(0,0), B(–1,6),C(4,2). Connect them to form a triangle.

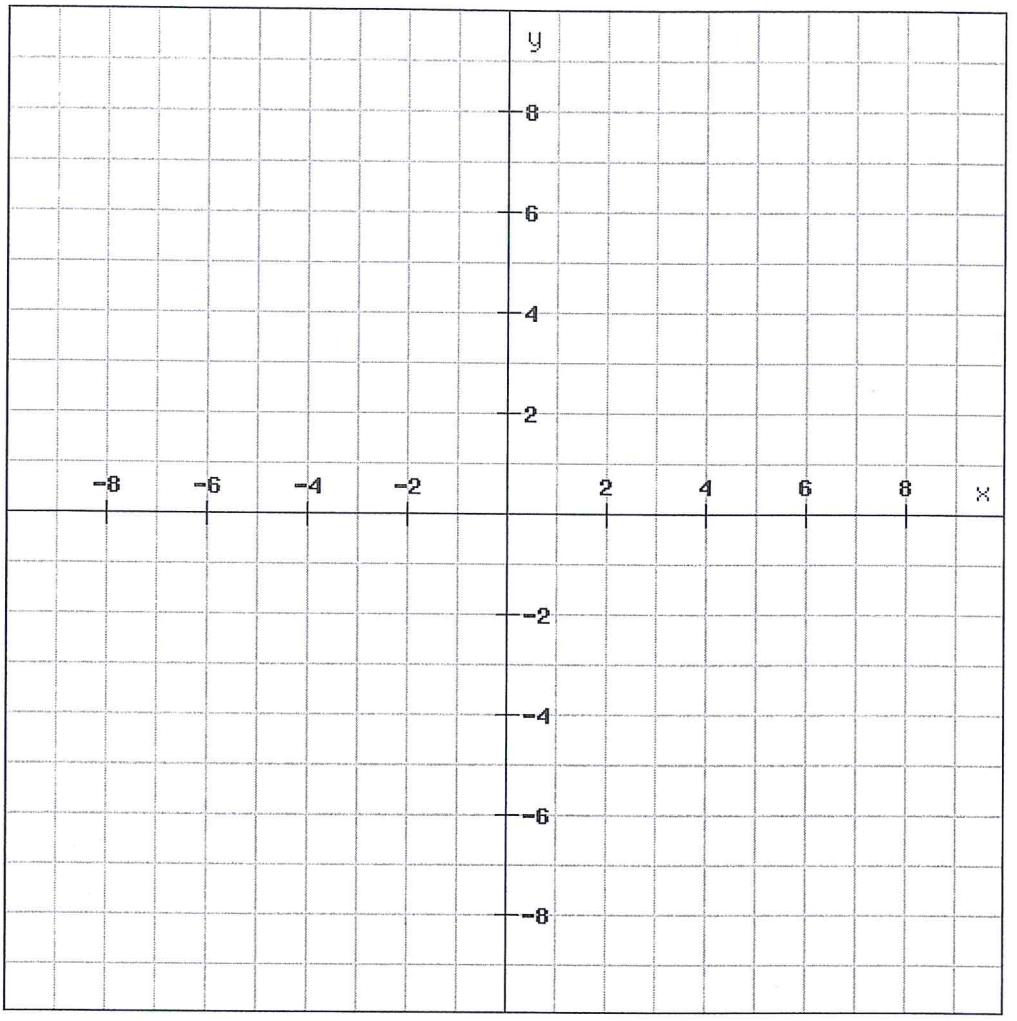


a. Indicate the following points on the plane: A'(4,0), B'(3,6),C'(8,2), Connect them to form a triangle.

b. What can you say about the location of the 2nd triangle in comparison to the first one?

c. This is a _____ translation.

3. Indicate the following points on the plane: A(0,0), B(–1,6),C(4,2). Connect them to form a triangle.

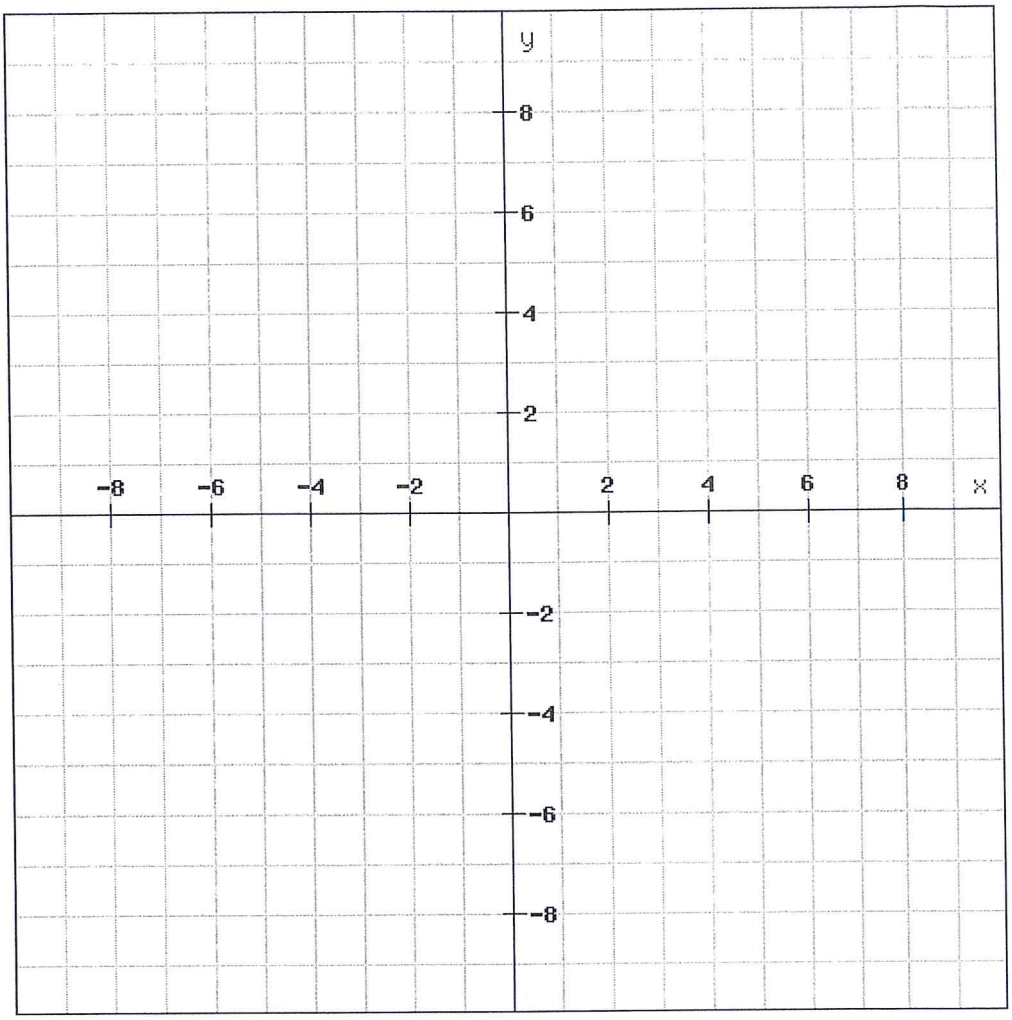


a. Indicate the following points on the plane: A'(–2,–3), B'(–3,3),C'(2,–1), Connect them to form a triangle.

b. What can you say about the location of the 2nd triangle in comparison to the first one?

c. This is a _____ and _____ translations.

4. Indicate the following points on the plane: A(1,0), B(–2,6),C(6,3). Connect them to form a triangle.



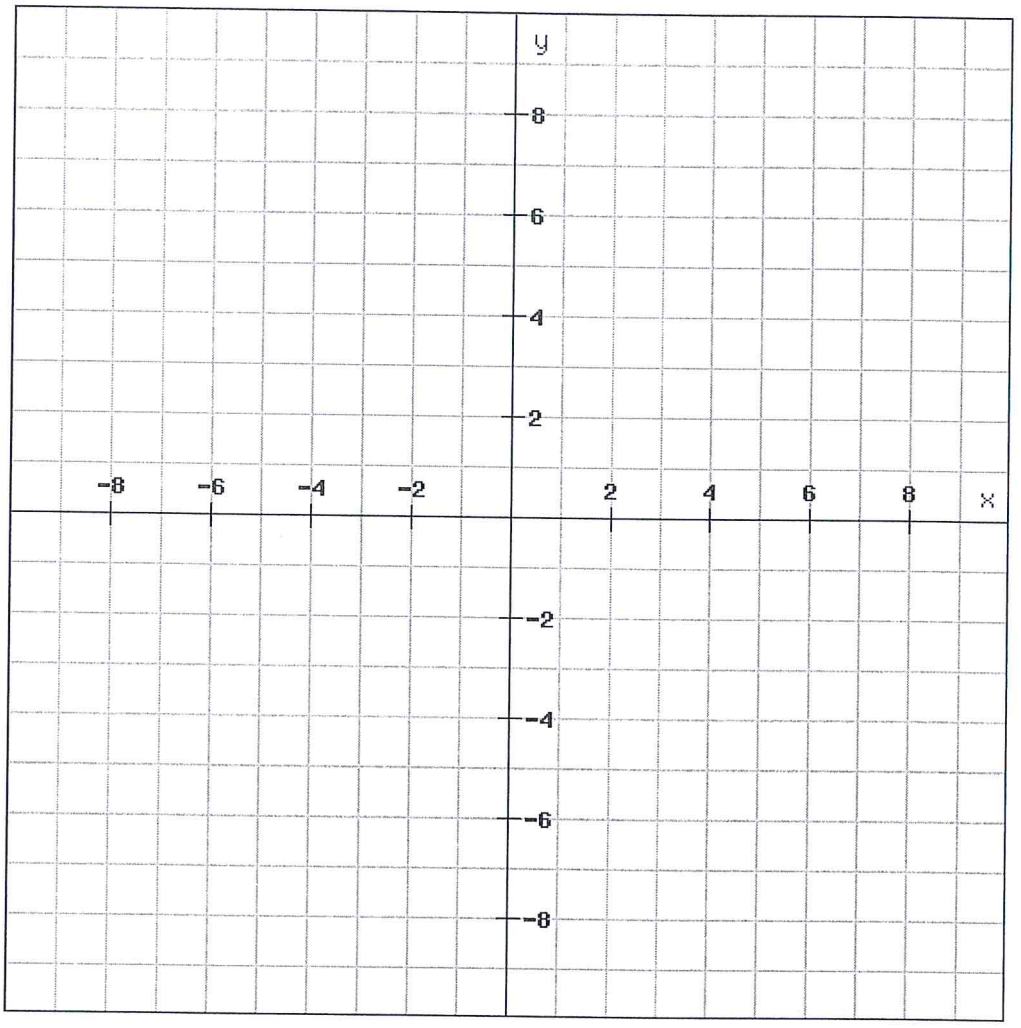
a. Indicate the following points on the plane: A'(–1,0), B'(2,6),C'(–6,3), Connect them to form a triangle.

b. What can you say about the location of the 2nd triangle in comparison to the first one?

c. This is a _____ across the y axis.

d. On changing x into ____ we are generating a _____ across the _____

5. Indicate the following points on the plane: A(1,1), B(–2,6),C(6,3). Connect them to form a triangle.



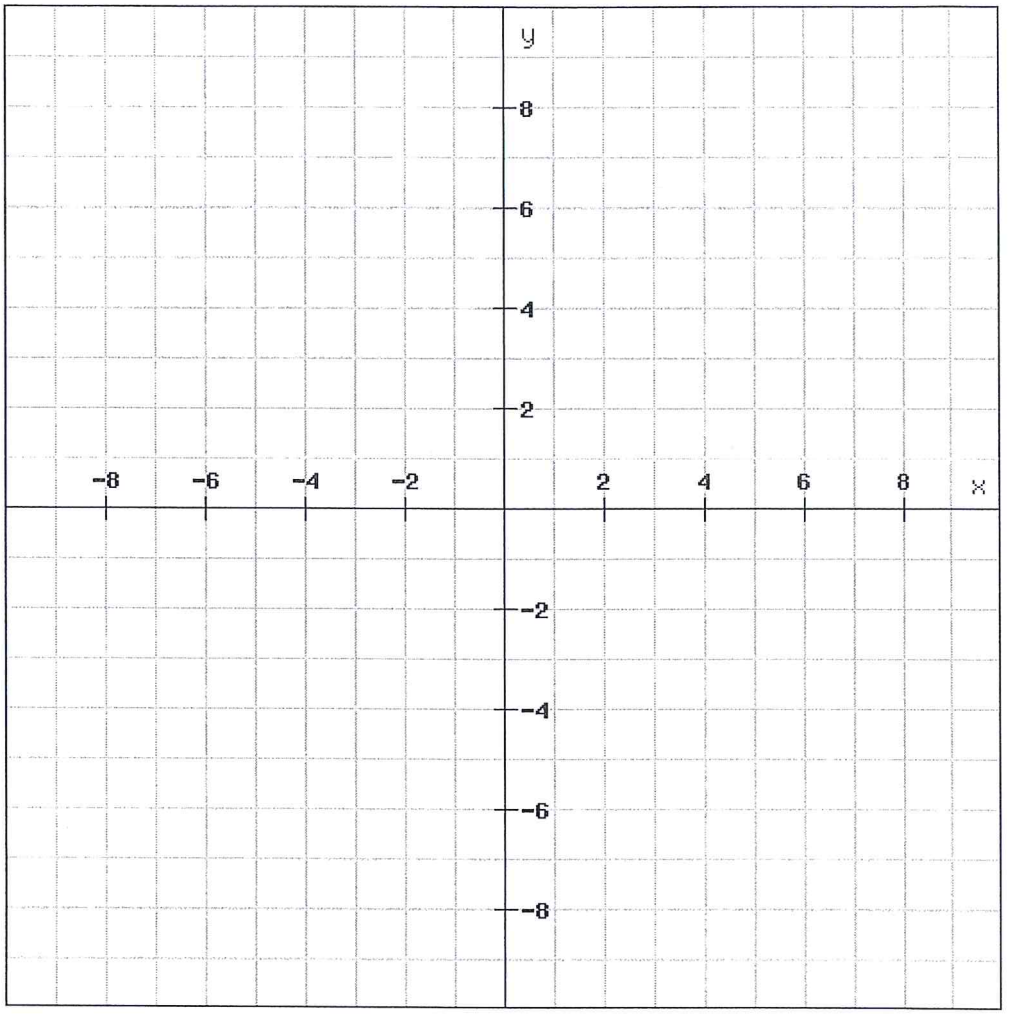
a. Indicate the following points on the plane: A'(1,–1), B'(–2,–6),C'(6,–3), Connect them to form a triangle.

b. What can you say about the location of the 2nd triangle in comparison to the first one?

c. This is a _____ across the x axis.

d. On changing y into ____ we are generating a _____ across the _____

6. Indicate the following points on the plane: A(–4,0), B(0,4),C(4,0), D(0, –4). Connect them to form a square.



a. Indicate the following points on the plane: $\sqrt{8} \approx 2.83$

A'$(-\sqrt{8},\sqrt{8})$,B'$(\sqrt{8},\sqrt{8})$, C'$(\sqrt{8},-\sqrt{8})$, D'$(-\sqrt{8},-\sqrt{8})$ Connect them to form a square.

b. What can you say about the location of the 2nd square in comparison to the first one?

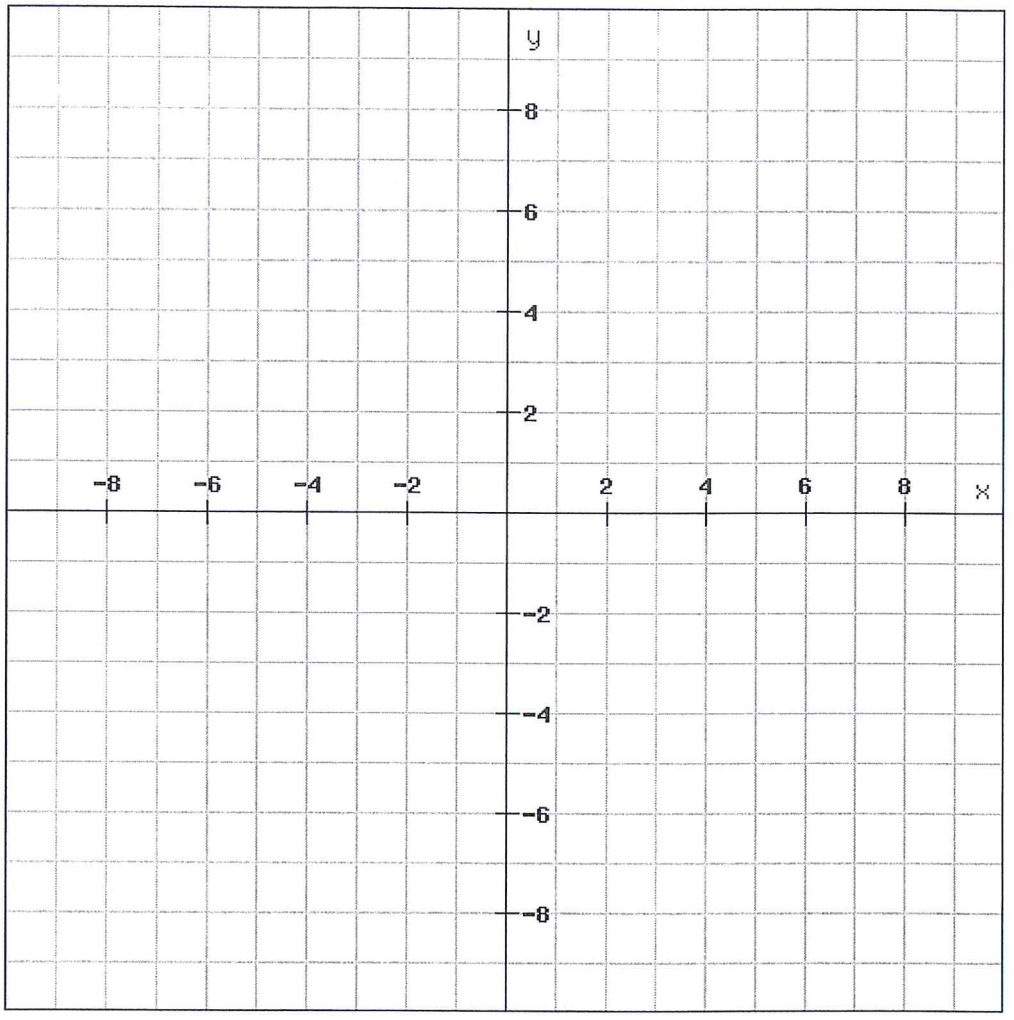
c. This is a _____ of ____ degrees.

d. Write down the coordinates of a square that is a rotation of 90° of the first one:

A'' = (__, __), B'' = (__, __), C'' = (__, __), D'' = (__, __)

Conclusions?

7. Indicate the following points on the plane: A(–5,0), B(5,0). Given also the point C(0,a)



a. Show that the value of a in order to create an equilateral triangle is: $\sqrt{75}$
b. Write down the coordinates of the new points after translating the triangle 3 units left and 1 down.

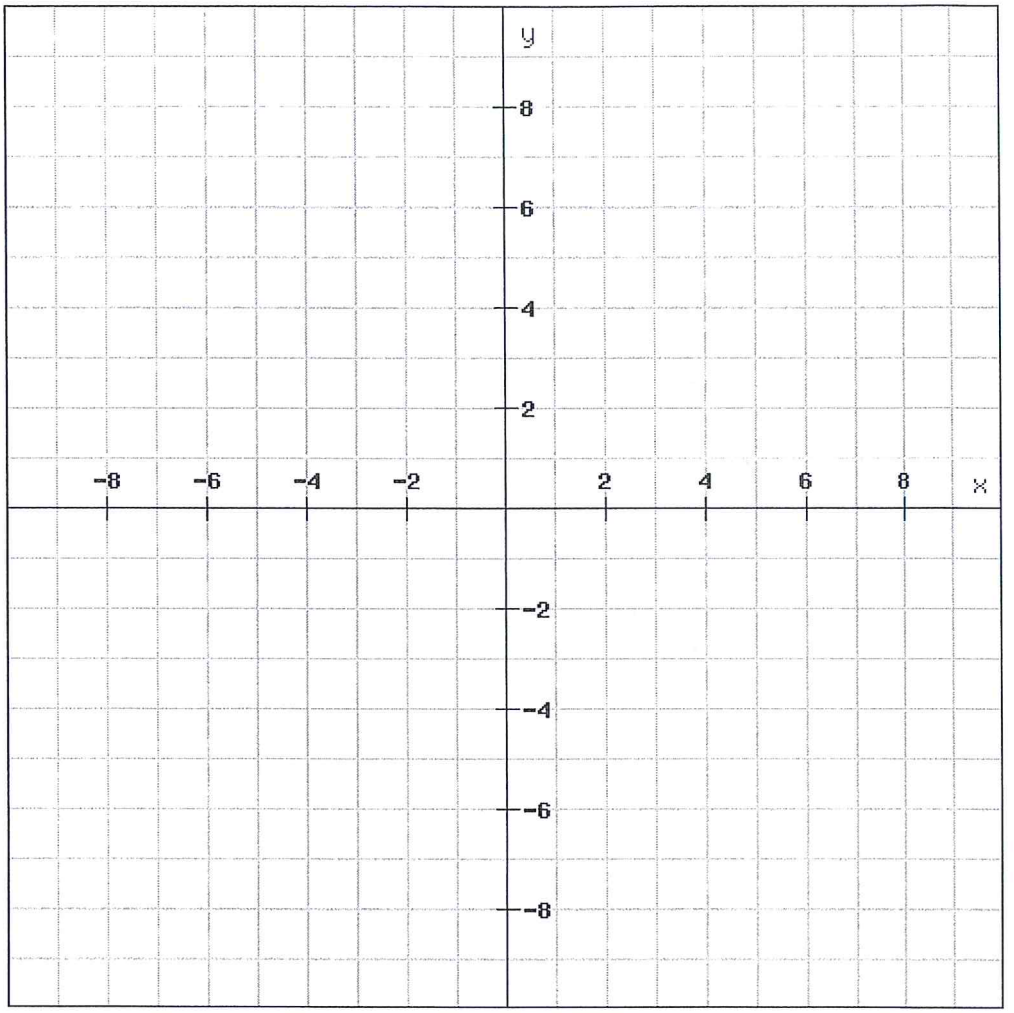
   A' = (__,__), B' = (__,__), C' = (__,__)
c. Write down the coordinates of the new points after rotation the triangle 30° clockwise.

   A'' = (__,__), B'' = (__,__), C'' = (__,__)

d. Write down the coordinates of the new points after rotation the triangle 60° clockwise.

   A''' = (__,__), B''' = (__,__), C''' = (__,__)

8. Indicate the following points on the plane: A(1,0), B(–2,5),C(4,3). Connect them to form a triangle.



a. Indicate the following points on the plane: A'(2,0), B'(–4,10),C'(8,6), Connect them to form a triangle.

b. What can you say about the 2nd triangle in comparison to the first one?

c. This is a _____ factor ____

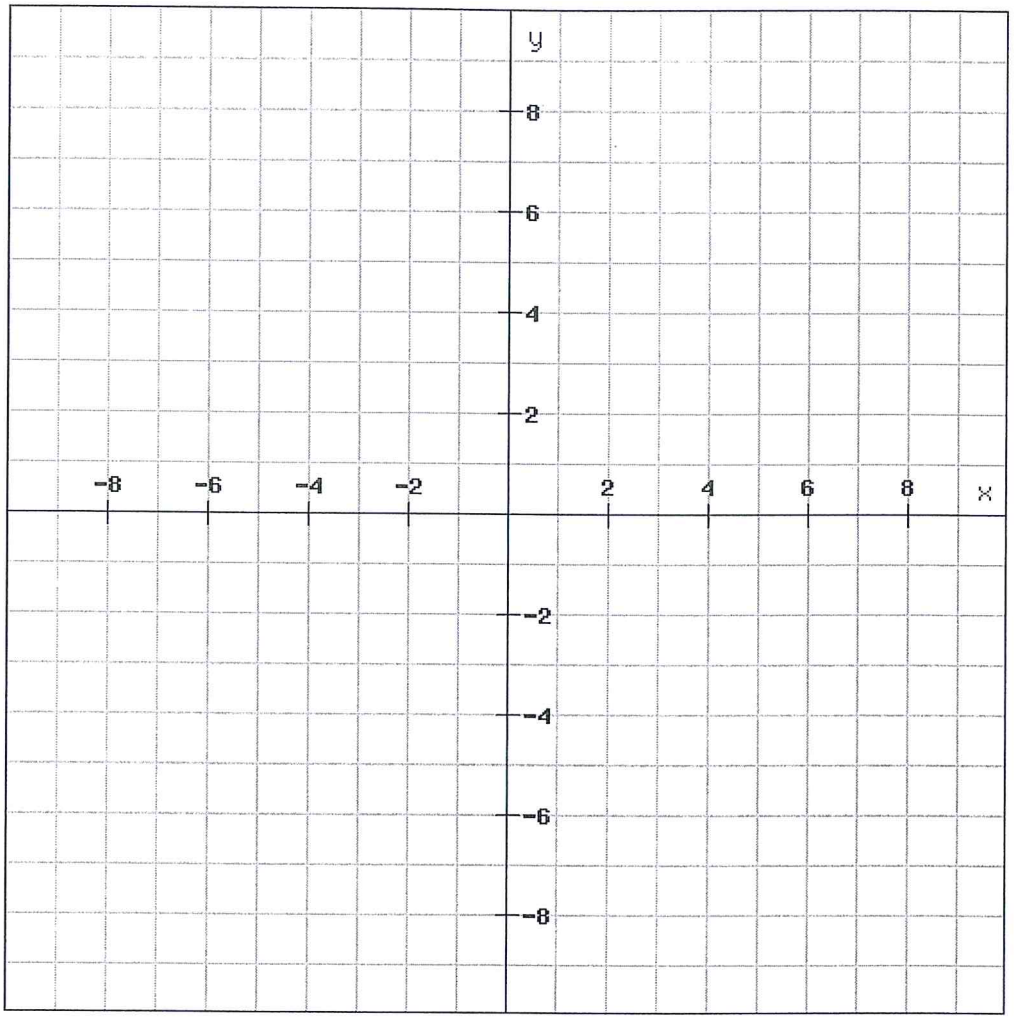
d. Indicate the following points on the plane: A'(0.5,0), B'(–1,2.5),C'(2,1.5), Connect them to form a triangle.

e. What can you say about the 2nd triangle in comparison to the first one?

f. This is a _____ factor ____

g. When making all sides of a shape bigger or smaller using the same factor the shape remains _____ to the original one.

9. Indicate the following points on the plane: A(0,0), B(2, 0),C(0,–3). Connect them to form a triangle.



a. Indicate the points of he triangle formed if we enlarge this triangle by 3.

A' = (__, __), B' = (__, __), C' = (__, __)

b. Find the relations:

$$\frac{A'B'}{AB} = \qquad \frac{A'C'}{AC} = \qquad \frac{B'C'}{BC} =$$

10. Given a triangle ABC whose sides are 3, 4 and 5 cm long.

    a. Is his a right angled triangle?
    b. Find the sides of another triangle whose sides are half the length of the sides of ABC. Is this triangle right angled?

11. Given a triangle ABC whose sides are 2, 4 and x cm long. A similar triangle has sides y, 6 and z correspondingly.

    a. Find y
    b. Find $\frac{z}{x}$
    c. Is it possible to find a value for x so that ABC will be right angled? If yes, find it (all possibilities).
    d. Find z in that case(s)

12. Given a rectangle ABCD whose sides are 5, and x cm long. A similar rectangle has sides y and 12 cm correspondingly. The perimeter of the 1st rectangle is 8 units longer than the perimeter of the 2nd one.

    a. Find x and y

    b. Find the area of the rectangles A_1 and A_2.

    c. Find the quotient $\frac{A_2}{A_1}$, conclusions?

13. Given that the area of a square is 16 times as big as the area of a different square. Find the ratio between the sides of the squares.

14. Explain the meaning of the operation "Zooming in/out" frequently used in digital imaging.

CHAPTER 6

6.1. – INTERNATIONAL SYSTEM OF UNITS

1. Meter(m) is a unit of _____ Other units of _____ are: _____
2. Meter square (m^2) is a unit of _____ Other units of _____ are: _____
3. An area has units of _____A length has units of _____
4. Kilo = __ Mili = __

Convert the units, use scientific notation in at least one of each type of exercises:

5. How many metres in 2.5 km?
6. How many metres in 0.5 km?
7. How many metres^2 in $\frac{1}{3}$ km^2?
8. How many metres in 56 km?
9. How many metres in 2500 km?
10. How many km^2 in 26 m^2?
11. How many km in 75 m?
12. How many km in 1000 m?
13. How many m in $5.2 \cdot 10^7$ km?
14. How many km^2 in $5.12 \cdot 10^8$ m^2?
15. How many mm in 3.04 m?
16. How many mm^2 in 0.5 m^2?
17. How many mm^2 in 1 m^2?
18. How many mm in 2 m?
19. How many mm in 2.5 m?
20. How many mm^2 are 1.35 m^2?
21. How many cm in $\frac{1}{3}$ m?
22. How many cm^2 in 56 m^2?

23. How many cm in 3.1 km?

24. How many mm^2 in 0.5 cm^2?

25. How many cm in in 120 m?

26. How many mm^2 in 5.1 cm^2?

27. How many cm in 17 km?

28. How many m in 12392 km?

29. How many mm^2 in 5.1 m^2?

30. How many m^2 in 2.2 mm^2?

31. How many cm in 13.12 m?

32. Complete the table:

mm	cm	m	km
14			
	65		
		3	
			5
12.5			
	3.7		
		4.78	
			1.31
			0.008
mm^2	cm^2	m^2	Km^2
14			
	65		
		3	
			5
12.5			
	3.7		
		4.78	
			1.31
			0.008

6.2. – COMMON ERRORS

1. $\sqrt{A+B} = \sqrt{A} + \sqrt{B}$ True / False, Give an example to show your answer.

2. $\sqrt{A^2 + B^2} = A + B$ True / False, Give an example to show your answer.

3. $(A+B)^2 = A^2 + B^2$ True / False, if false write the correct version.

4. $(A+B)(A-B) = A^2 + B^2$ True / False, Give an example to show your answer.

5. $(A+B)(A-B) = A^2 - B^2$ True / False, if false write the correct version..

6. $(x+2)^2 = x^2 + 4x + 2$ True / False, if false write the correct version.

7. $(A-B)^2 = A^2 - B^2$ True / False, Give an example to show your answer.

8. $(2x-3)^2 = 4x^2 - 6x + 9$ True / False, if false write the correct version.

9. $(\sqrt{a}-3)^2 = a^2 - 6a + 9$ True / False, if false write the correct version.

10. $x^2 x^3 = x^6$ True / False, if false write the correct version.

11. $(x^2)^3 = x^{(2^3)}$ True / False, if false write the correct version.

12. $\frac{x^{10}}{x^2} = x^5$ True / False, if false write the correct version.

13. $x^1 = 1$ True / False, if false write the correct version.

14. $x^0 = 0$ True / False, if false write the correct version.

15. $-3^2 = (-3)^2$ True / False, if false write the correct version.

16. $(4x^2) = (4x)^2$ True / False, if false write the correct version.

17. $\sqrt{7x} = 7x^{\frac{1}{2}}$ True / False, if false write the correct version.

18. $\frac{0}{2} = \frac{2}{0}$ True / False, if false write the correct version.

19. $\frac{14+x}{14} = x$ True / False, if false write the correct version.

20. $\frac{7-x}{7} = x-1$ True / False, if false write the correct version.

21. $\frac{a+b}{a} = 1+\frac{b}{a}$ True / False, if false write the correct version.

22. $\frac{14+x}{14} = x+\frac{x}{14}$ True / False, if false write the correct version.

23. $\frac{1}{x+y} = \frac{1}{x}+\frac{1}{y}$ True / False, if false write the correct version.

24. An **expression** and an **equation** is the same thing. True / False

25. $\dfrac{\left(\dfrac{a}{b}\right)}{c} = \dfrac{a}{\left(\dfrac{b}{c}\right)}$ True / False, if false write the correct version.

26. $-a^2 = (-a)^2$ True / False, if false write the correct version.

27. $a^{-2} = (-a)^2$ True / False, if false write the correct version.

28. $a^{-2} = -a^2$ True / False, if false write the correct version.

29. $a^{-2} = -\dfrac{1}{a^2}$ True / False, if false write the correct version.

30. $a^{-2} = \dfrac{1}{a^2}$ True / False, if false write the correct version.

31. $a^{-1} = -\dfrac{1}{a}$ True / False, if false write the correct version.

32. $\dfrac{1}{2} + \dfrac{1}{3} = \dfrac{1}{2+3}$ True / False, if false write the correct version.

33. $a^{-1} + a^{-1} = a^{-2}$ True / False, if false write the correct version.

34. $a^{-1}a^{-1} = a^{-2}$ True / False, if false write the correct version.

35. $a^{-2}a^{-3} = a^{-6}$ True / False, if false write the correct version.

36. $a^{-2} + a^{-3} = a^{-5}$ True / False, if false write the correct version.