Final Exam Practice

Symmetry and Surface Area

1. How many lines of symmetry do the following shapes have?

a. Equilateral Triangle: 3

b. Isosceles Triangle: 1

c. Scalene Triangle: 0

d. Square: 4

e. Rectangle: 2

f. Regular Pentagon: 5

g. Regular Hexagon: 6

h. Regular Heptagon: 7

i. Regular Octagon: 8

j. Regular Nonagon: 9

k. Regular Decagon: 10

2. What is the angle of rotational symmetry of the following shapes?

a. Equilateral Triangle: 120°

b. Isosceles Triangle: 360°

c. Scalene Triangle: 360°

d. Square: 90°

e. Rectangle: 180°

f. Regular Pentagon: 72°

g. Regular Hexagon: 60°

h. Regular Heptagon: 51.4°

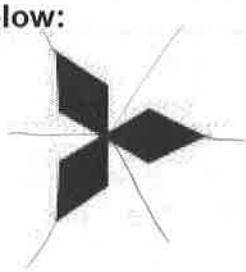
i. Regular Octagon: 45°

j. Regular Nonagon: 40°

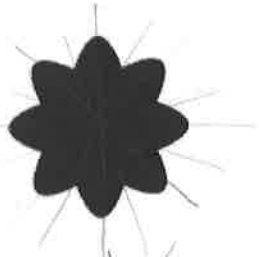
k. Regular Decagon: 36°

3. Determine the number of lines of symmetry AND order of rotational symmetry for the figures shown below:

a. 3 and 120°

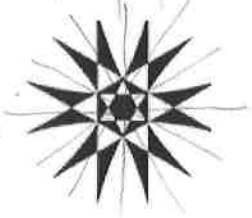


b. 8 and 45°



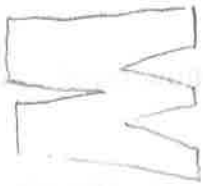
c. 1 and 360°

d. 6 and 60°

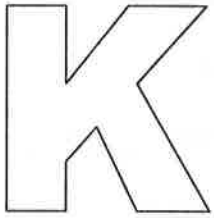


4. Draw the following rotations for each letter:

a. 

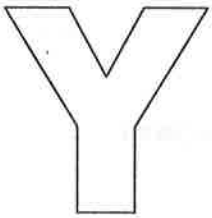
90° clockwise rotation 

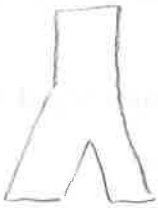
180° counterclockwise rotation 

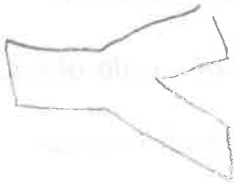
b. 

270° clockwise rotation 

90° counterclockwise rotation 

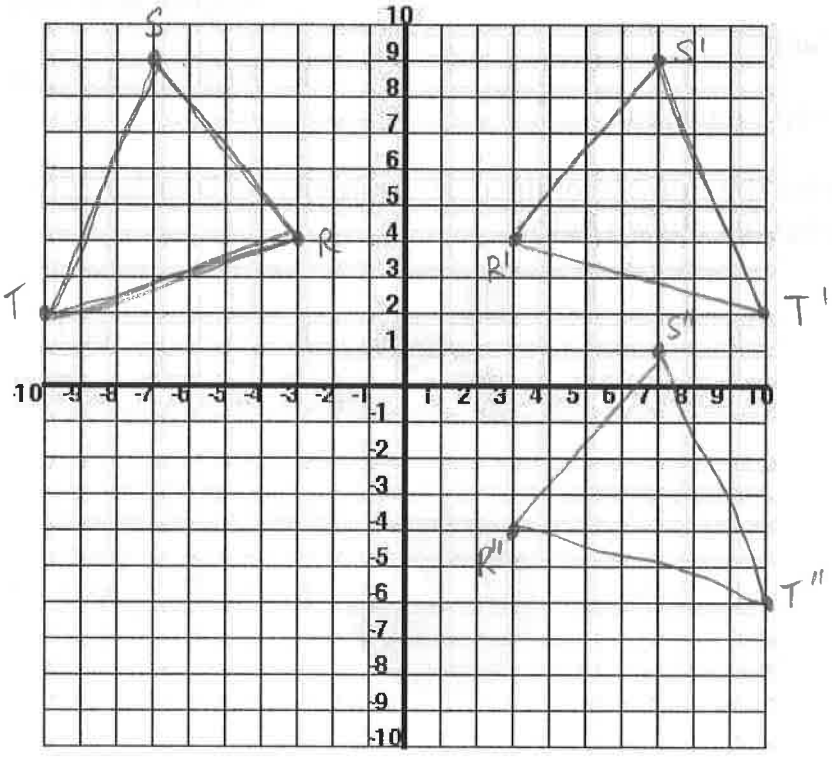
c. 

180° clockwise rotation 

270° counterclockwise rotation 

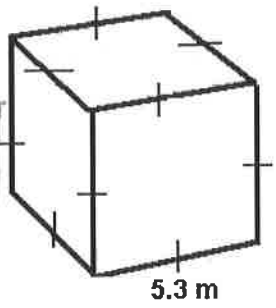
5. Complete the following diagram:

a. Plot and label the following triangle: R(-3, 4), S(-7, 9), T(-10, 2)
b. Reflect the triangle across the y-axis and label it $R^1S^1T^1$
c. Translate triangle $R^1S^1T^1$ 8 units down and label it $R^{11}S^{11}T^{11}$

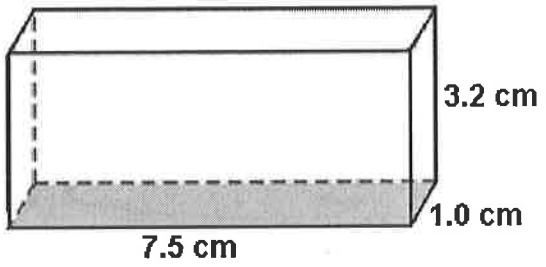


6. Solve for the surface area of the cube:

$6 \cdot (5.3)^2 = \boxed{168.54 m^2}$



7. Solve for the surface area of the rectangular prism:



$2(lw) + 2(lh) + 2(wh)$

$= 2(7.5)(1.0) + 2(7.5)(3.2) + 2(1.0)(3.2)$

$= 15.0 + 48.0 + 6.4$

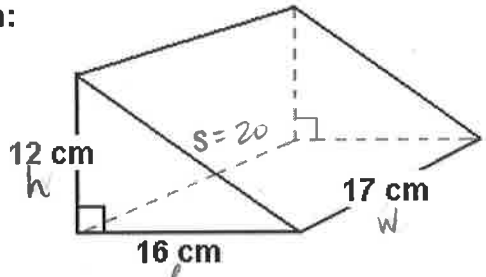
$= \boxed{69.4 cm^2}$

8. Solve for the surface area of the triangular prism:

$a^2 + b^2 = c^2$

$12^2 + 16^2 = s^2$

$s = \boxed{20 cm}$



$SA = lw + lh + wh + ws$

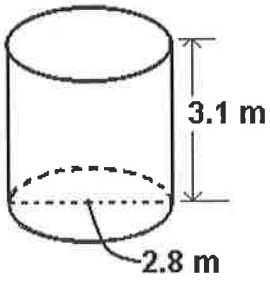
$SA = (16)(17) + (16)(12) + (17)(12) + (17)(20) = \boxed{1008 cm^2}$

9. Solve for the surface area of the cylinder:

$SA = 2\pi r^2 + 2\pi rh$

$= 2\pi (1.4)^2 + 2\pi (1.4)(3.1)$

$= \boxed{39.6 m^2}$

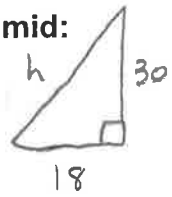


$r = 1.4 m$

10. Solve for the surface area of the pyramid:

$h^2 = 18^2 + 30^2$

$h = 35$

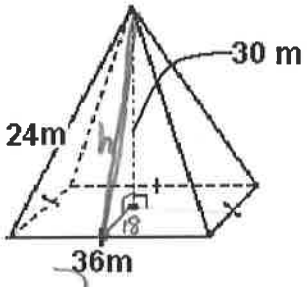


$A(\Delta) = \frac{1}{2} bh = \frac{1}{2}(36)(35)$

$= 630$

$4\ \Delta s = 4 \cdot 630 = 2520 m^2$

Square base $= 36 \times 36 = 1296 m^2$

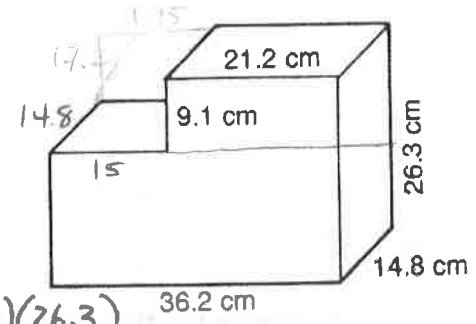


$2520 + 1296$

$= \boxed{3816 m^2}$

11. Solve for the surface area of the following composite solids:

a. _____



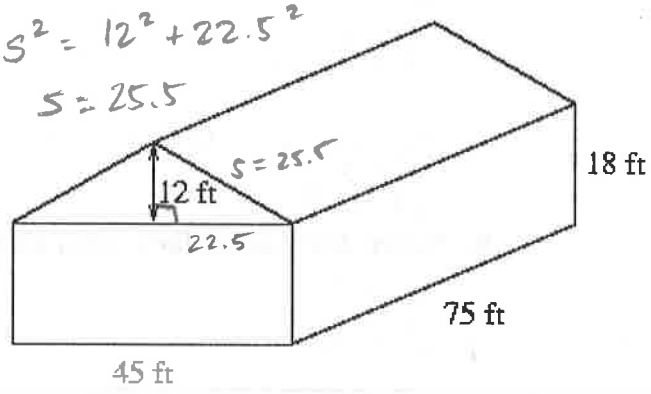
S. Area of faces from 'offset' is the same as the S. Area as if it was there

$SA = 2(lw) + 2(lh) + 2(wh)$

$= 2(36.2)(14.8) + 2(36.2)(26.3) + 2(14.8)(26.3)$

$= 3754.12\ cm^2$

b. _____



$2\ \Delta s: \ 2 \cdot \frac{1}{2} bh = bh = (45)(12) = 540\ ft^2$

2 roof panels: $2(75)(25.5) = 3825\ ft^2$

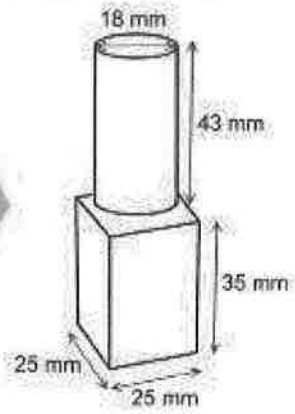
rest: $(lw) + 2(lh) + 2(wh)$

$= (75)(45) + 2(75)(18) + 2(45)(18) = 7695\ ft^2$

TOTAL $= 540 + 3825 + 7695 =$ **$12060\ ft^2$**

c. _____

ignore the circle areas! (both of them!)



SA (rect prism)

$= 2(lw) + 2(lh) + 2(wh)$

$= 2(25)(25) + 2(25)(35) + 2(25)(35)$

$= 4750\ mm^2$

SA (cylinder side only)

$= 2\pi rh = 2\pi(9)(43) = 2431.6\ mm^2$

TOTAL $= 4750 + 2431.6 =$ **$7181.6\ mm^2$**

Rational Numbers

1. Evaluate each of the following square roots:

a. $\sqrt{276} = 2\sqrt{69} = 16.61$

b. $\sqrt{81} = 9$

c. $\sqrt{400} = 20$

d. $\sqrt{2.25} = \sqrt{\frac{225}{100}} = \frac{\sqrt{225}}{\sqrt{100}} = \frac{15}{10} = 1.5 = \frac{3}{2}$

e. $\sqrt{0.64} = \sqrt{\frac{64}{100}} = \frac{8}{10} = 0.8 = \frac{4}{5}$

f. $\sqrt{0.01} = \sqrt{\frac{1}{100}} = \frac{1}{10} = 0.1$

g. $\sqrt{\frac{64}{121}} = \frac{8}{11} = 0.73$

h. $\sqrt{\frac{196}{169}} = \frac{14}{13} = 1.08$

2. Circle the rational numbers:

$\sqrt{324}$ $\quad \pi \quad$ $2.\overline{681}$ $\quad \frac{49}{0} \quad$ $18 \quad -2\frac{1}{3}$

$\frac{0}{-15} \quad 0.3894... \quad \sqrt{33} \quad 1.25 \quad -\frac{19}{5} \quad -7$

3. Circle the perfect squares:

$256 \quad \frac{1}{10} \quad 0.169 \quad \frac{9}{25} \quad 200 \quad -\frac{49}{100}$

$\frac{18}{36} \quad 1.21 \quad \frac{2.25}{25} \quad 0.09 \quad \frac{81}{361} \quad -16$

4. Evaluate and write your final answer in reduced form:

a. $\frac{1}{4} + \frac{7}{20} = \frac{5}{20} + \frac{7}{20} = \frac{12}{20} = \frac{3}{5}$

b. $2\frac{4}{5} + 1\frac{9}{10} = \frac{14}{5} + \frac{19}{10} = \frac{28}{10} + \frac{19}{10} = \frac{47}{10}$

c. $\frac{7}{8}-\frac{5}{6}=$ $\frac{21}{24}-\frac{20}{24}=\boxed{\frac{1}{24}}$

d. $3\frac{1}{6}-2\frac{2}{3}=$ $\frac{19}{6}-\frac{8}{3}=\frac{19}{6}-\frac{16}{6}=\frac{3}{6}=\boxed{\frac{1}{2}}$

e. $\frac{4}{15}\times 9=$ $\frac{4}{15}\cdot\frac{9}{1}=\frac{36}{15}=\boxed{\frac{12}{5}}$ or $\boxed{2\frac{2}{5}}$

f. $\left(2\frac{1}{2}\right)\left(1\frac{1}{15}\right)=$ $\left(\frac{5}{2}\right)\left(\frac{16}{15}\right)=\frac{80}{30}=\boxed{\frac{8}{3}}$ or $\boxed{2\frac{2}{3}}$

g. $\frac{2}{5}\div\frac{4}{15}=$ $\frac{2}{5}\cdot\frac{15}{4}=\frac{30}{20}=\boxed{\frac{3}{2}}$ or $\boxed{1\frac{1}{2}}$

h. $5\frac{1}{2}\div 3\frac{1}{3}=$ $\frac{11}{2}\div\frac{10}{3}=\frac{11}{2}\cdot\frac{3}{10}=\boxed{\frac{33}{20}}$ or $\boxed{1\frac{13}{20}}$

i. $\left(\frac{5}{8}-\frac{1}{4}\right)\div\frac{2}{3}=$ $\left(\frac{5}{8}-\frac{2}{8}\right)\cdot\frac{3}{2}=\frac{3}{8}\cdot\frac{3}{2}=\boxed{\frac{9}{16}}$

j. $\frac{3}{4}+\left(\frac{1}{2}\times\frac{2}{3}\right)=$ $\frac{3}{4}+\left(\frac{2}{6}\right)=\frac{9}{12}+\frac{4}{12}=\boxed{\frac{13}{12}}$ or $\boxed{1\frac{1}{12}}$

k. $-\frac{4}{5}\left(-\frac{3}{4}+\frac{1}{3}\right)=$ $-\frac{4}{5}\left(-\frac{9}{12}+\frac{4}{12}\right)=\frac{-4}{5}\left(\frac{-5}{12}\right)=\frac{20}{60}=\boxed{\frac{1}{3}}$

l. $\frac{-5}{6}+\frac{-2}{3}\times\frac{3}{4}=$ $-\frac{5}{6}+\left(\frac{-6}{12}\right)=-\frac{5}{6}-\frac{1}{2}=-\frac{5}{6}-\frac{3}{6}$

$=-\frac{8}{6}=\boxed{\frac{-4}{3}}$ or $\boxed{-1\frac{1}{3}}$

5. Complete the following substitution questions:

a. $3x - 24$ if $x = -9$

$= 3(-9) - 24 = -27 - 24 = \boxed{-51}$

b. $-2a^2 + 10a$ if $a = 4$

$= -2(4)^2 + 10(4)$

$= -2(16) + 40 = -32 + 40 = \boxed{8}$

c. $-y^3 + 9y^2 - 14$ if $y = -2$

$= -(-2)^3 + 9(-2)^2 - 14 = -(-8) + 9(4) - 14$

$= 8 + 36 - 14$

$\boxed{= 30}$

d. $6b^2 - 11b - 7$ if $b = -5$

$= 6(-5)^2 - 11(-5) - 7 = 6(25) + 55 - 7$

$= 150 + 55 - 7$

$= \boxed{198}$

e. $-17a^2 + 9ab - 3b^2$ if $a = 3$ and $b = -6$

$= -17(3)^2 + 9(3)(-6) - 3(-6)^2$

$= -17(9) + (-162) - 3(36)$

$= -153 - 162 - 108$

$\boxed{= -423}$

Powers and Exponents

1. Simplify the following expressions:

a. $4^3 \times 4^5 = 4^{3+5} = \boxed{4^8}$

b. $9^2 \times 9 \times 9^8 = 9^{2+1+8} = \boxed{9^{11}}$

c. $(3^3)(3^{11}) = 3^{3+11} = \boxed{3^{14}}$

d. $\dfrac{10^{14}}{10^3} = 10^{14-3} = \boxed{10^{11}}$

e. $\dfrac{x^5}{x} = x^{5-1} = \boxed{x^4}$

f. $(6^2)^7 = 6^{2 \cdot 7} = \boxed{6^{14}}$

g. $(-3)^5)^2 = (-3)^{5 \cdot 2} = \boxed{(-3)^{10}} = \boxed{3^{10}}$

h. $(-4^3)^9 = -4^{3 \cdot 9} = \boxed{-4^{27}}$

i. $\left(\dfrac{3}{7}\right)^x = \boxed{\dfrac{3^x}{7^x}}$

j. $\dfrac{(x^4)(x^3)^5}{x^2 \times x} = \dfrac{(x^4)(x^{3 \cdot 5})}{x^{2+1}} = \dfrac{(x^4)(x^{15})}{x^3}$

$= \dfrac{x^{4+15}}{x^3} = \dfrac{x^{19}}{x^3} = x^{19-3}$

$= \boxed{x^{16}}$

2. Evaluate the following expressions:

a. $\dfrac{2^3 \times 2^4}{2^5} = \dfrac{2^7}{2^5} = 2^2 = \boxed{4}$

b. $\left(\dfrac{(5^7)(5^2)}{5(5^5)}\right) = \dfrac{5^{14}}{5^6} = 5^8$

$= \boxed{390625}$

c. $11^{10} \div 11^8 = 11^2 = \boxed{121}$

d. $0.5^6 \div 0.5^4 = (0.5)^2 = \boxed{0.25}$

e. $7^0 = \boxed{1}$

f. $d^0 = \boxed{1}$

g. $(-5)^2 = \boxed{25}$

h. $-9^2 = \boxed{-81}$

i. $(-3^2)^2 = (-9)^2 = \boxed{81}$

j. $\left(\dfrac{1}{6}\right)^3 = \boxed{\dfrac{1}{216}}$

k. $\left(\dfrac{-2}{5}\right)^2 = \boxed{\dfrac{4}{25}}$

l. $\left(\dfrac{(-2)^3 \times (-8)}{4^2}\right)^4 = \left(\dfrac{(-8) \cdot (-8)}{16}\right)^4 = \left(\dfrac{64}{16}\right)^4$

$= 4^4 = \boxed{256}$

m. $\left(\dfrac{-22^4}{-3^3(-8)^3}\right)^0 = \boxed{1}$

Polynomials

1. Determine the degree of each expression:

a. $3xy^2$ degree = 3

b. 17 degree = 0

c. $15ab^3c^5$ degree = 9

d. $7x+2y$ degree = 1

e. $-2x^3+4x-11$ degree = 3

f. $8cd^4-c^5+4d^4$ degree = 5

g. $-xy+7-9x^2y^2+y^3$ degree = 4

2. Rewrite in descending order of x:

a. $13+x-4x^4-9x^2$ $-4x^4-9x^2+x+13$

b. $-3x^3y^2+5x^4-x-2-9x^2y$ $-3x^3y^2+5x^4-9x^2y-x-2$

3. Rewrite in ascending order of x:

a. $8x^5-3x^2+x-x^7$ $x-3x^2+8x^5-x^7$

b. $-6xy^2+x^4-1-x^2y+7x^3y^2$ $-1-6xy^2-x^2y+7x^3y^2+x^4$

4. Simplify the following expressions:

a. $3a^2+5a-9a^2=$ $-6a^2+5a$

b. $-10b^2+5b-2b^2-3b=$ $-12b^2+2b$

c. $-4w^2z-3z^3+2-3w^2z-11=$ $-7w^2z-3z^3-9$

d. $(9m-4m)+(2m+m)=$ $8m$

e. $(-11s-12t)+(-3s+9t)=$ $-14s-3t$

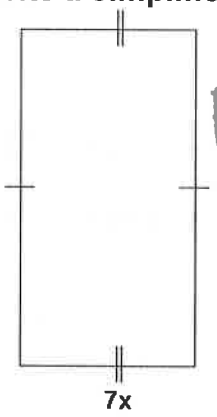
f. $(7x-y)-(9x+5y)=$ $-2x-6y$

g. $5a-6y-(7a-10y)=$ $-2a+4y$

h. $(8d^2+9d-13)-(d^2+11d-5)=$ $7d^2-2d-8$

5. Write a simplified expression for the perimeter of the following shapes:

a.

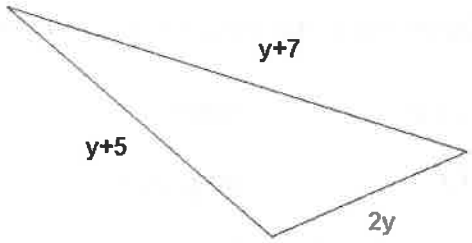


$P = 2(7x) + 2(6x)$

$= 14x + 12x$

$= \boxed{26x}$

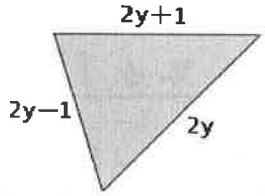
b.



$P = (y+5) + (y+7) + 2y$

$= \boxed{4y + 12}$

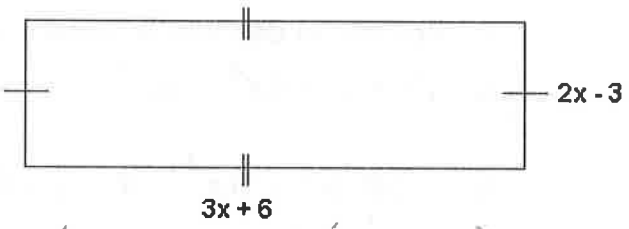
c.



$P = (2y+1) + (2y-1) + 2y$

$= \boxed{6y}$

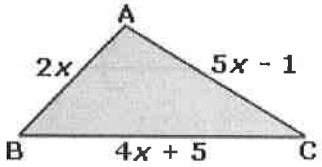
d.



$P = 2(2x-3) + 2(3x+6)$

$= 4x - 6 + 6x + 12 = \boxed{10x + 6}$

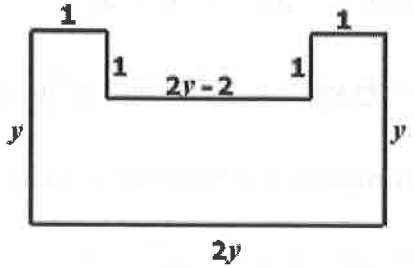
e.



$P = 2x + (5x-1) + (4x+5)$

$= \boxed{11x + 4}$

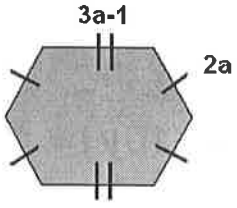
f.



$P = y + 1 + 1 + (2y-2) + 1 + 1 + y + 2y$

$= \boxed{6y + 2}$

g.

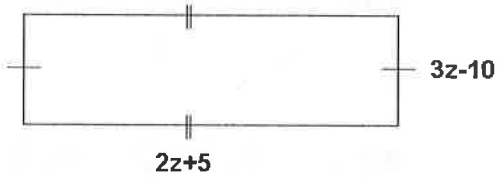


$P = 2(3a-1) + 4(2a)$

$= 6a - 2 + 8a$

$= \boxed{14a - 2}$

h.



$P = 2(3z-10) + 2(2z+5)$

$= 6z - 20 + 4z + 10$

$= \boxed{10z - 10}$

Linear Relations

1. Write the linear equation corresponding to each table of values below:

X	Y
-2	-2
-1	0
0	2
1	4
2	6

a. $y = 2x + 2$

X	Y
-1	6
0	2
1	-2
2	-6
3	-10

b. $y = -4x + 2$

X	Y
-3	15
-2	10
-1	5
0	0
1	-5

c. $y = -5x$

X	Y
0	-7
1	-10
2	-13
3	-16
4	-19

d. $y = -3x - 7$

X	Y
-2	3
-1	3.5
0	4
1	4.5
2	5

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

X	Y
1	1.666...
2	1.333...
3	1
4	0.666...
5	0.333...

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

2. List 3 points that can be found on the line of the following linear equations:

a. $y = 2x$ i. $(0, 0)$ ii. $(1, 2)$ iii. $(-1, -2)$

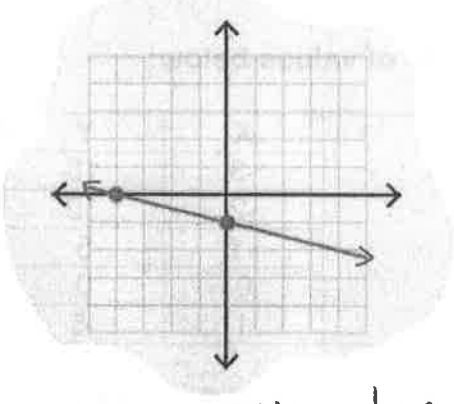
b. $y = -x + 3$ i. $(0, 3)$ ii. $(1, 2)$ iii. $(-1, 4)$

c. $y = 3x - 5$ i. $(0, -5)$ ii. $(1, -2)$ iii. $(-1, -8)$

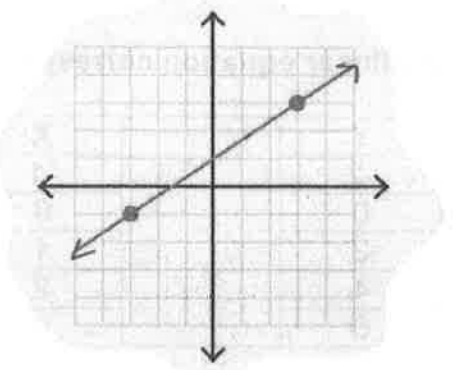
d. $y = \frac{1}{2}x + 1$ i. $(0, 1)$ ii. $(2, 2)$ iii. $(-2, 0)$

e. $y = -\frac{1}{4}x - 6$ i. $(0, -6)$ ii. $(4, -7)$ iii. $(-4, -5)$

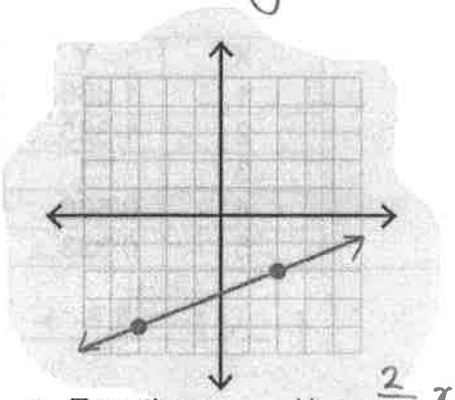
3. Determine the equation of the lines shown below:



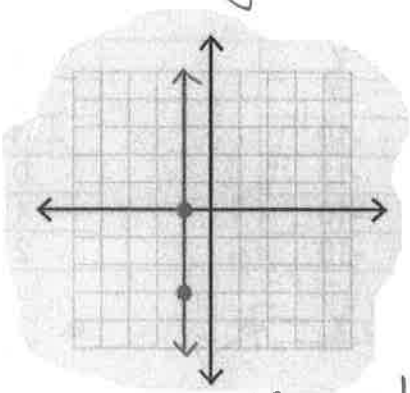
a. Equation: $y = -\frac{1}{4}x - 1$



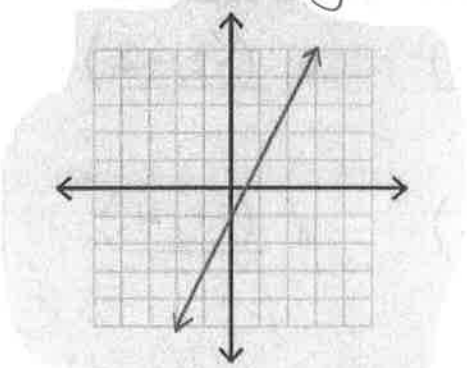
b. Equation: $y = \frac{2}{3}x + 1$



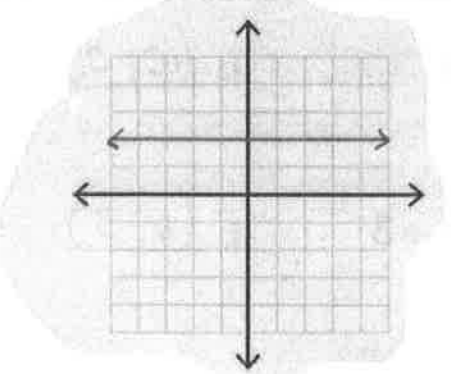
c. Equation: $y = \frac{2}{5}x - 3$



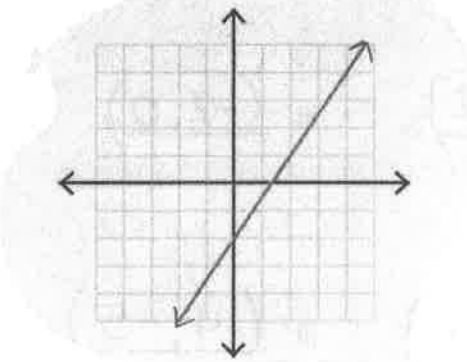
d. Equation: $x = -1$



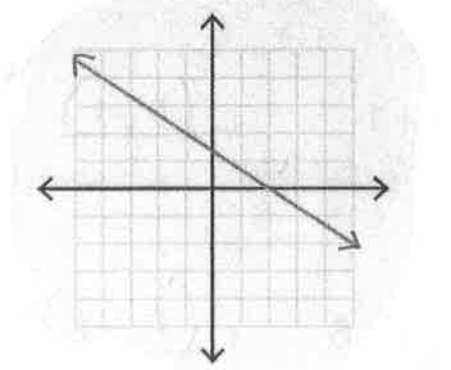
e. Equation: $y = 2x - 1$



f. Equation: $y = 2$



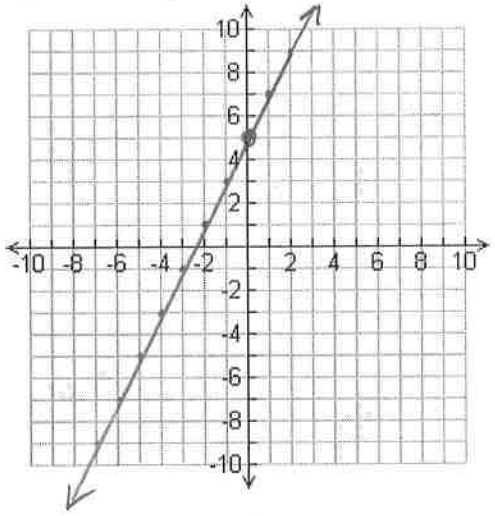
g. Equation: $y = \frac{3}{2}x - 2$



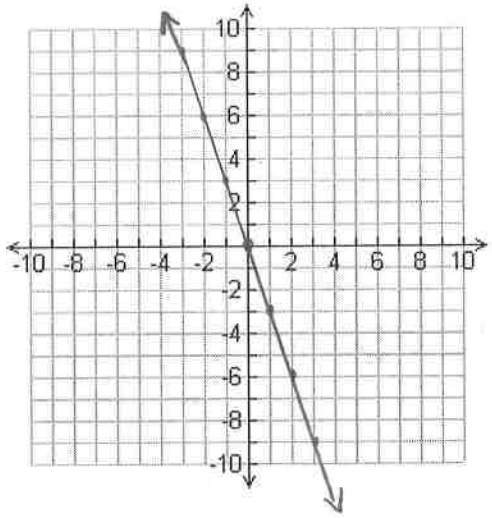
h. Equation: $y = -\frac{2}{3}x + \frac{3}{2}$

4. Graph each of the following linear equations:

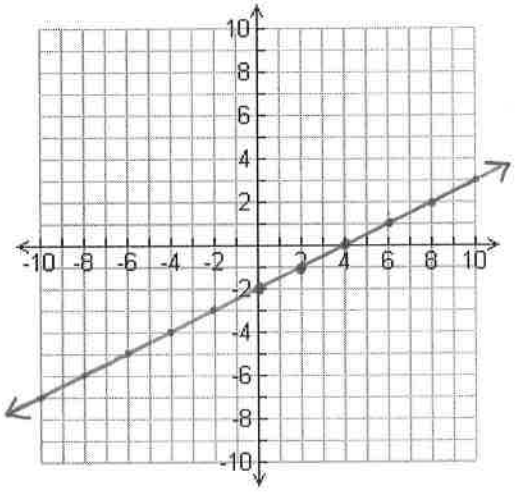
a. $y = 2x + 5$



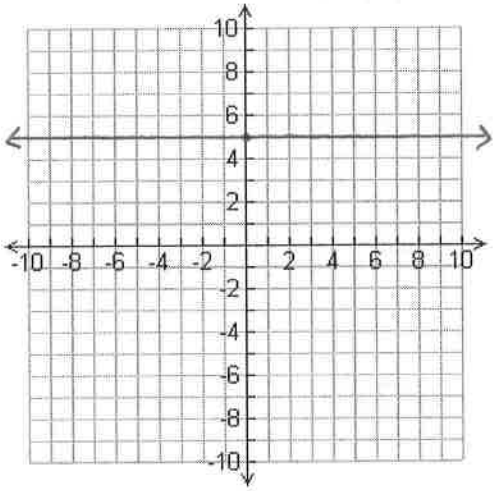
b. $y = -3x$



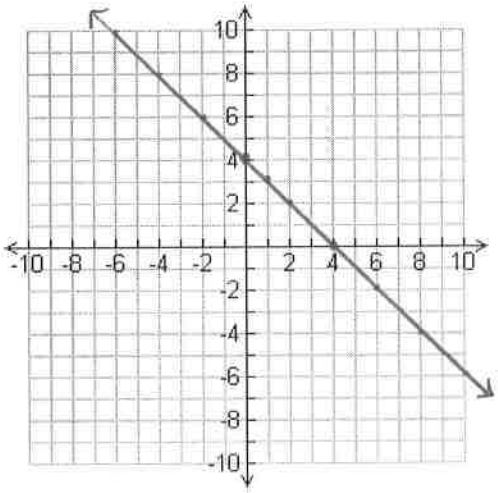
c. $y = \frac{1}{2}x - 2$



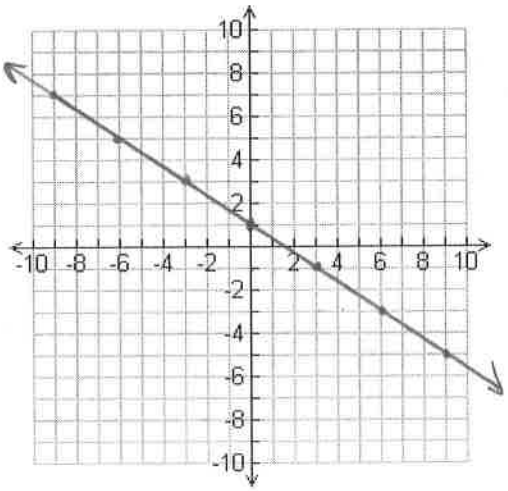
d. $y = 5$



e. $y = -x + 4$



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



Multiplying and Dividing Polynomials

1. Simplify the following expressions:

a. $3x(4x^2) =$ $12x^3$

b. $(-10y)(7x) =$ $-70xy$

c. $(3^2a^2b^2)(-7ab^3) =$ $-63a^3b^5$

d. $-8m^2n(2^3m^2n^3) =$ $-64m^4n^4$

e. $x(x+1) =$ x^2+x

f. $-5k(k-6) =$ $-5k^2+30k$

g. $-3(b^2+b-1) =$ $-3b^2-3b+3$

h. $-xy(3x^2+2xy-2y^3) =$ $-3x^3y-2x^2y^2+2xy^4$

i. $-7p^2(5p^3+8p-11) =$ $-35p^5-56p^3+77p^2$

j. $4x(-x^2-x+7)+3x =$ $-4x^3-4x^2+28x+3x$

$= -4x^3-4x^2+31x$

k. $5z(z-10)-8z(z+4) =$ $5z^2-50z-8z^2-32z$

$= -3z^2-82z$

l. $-x^3(x-2)+3x(x^3+1)-5x =$ $-x^4+2x^3+3x^4+3x-5x$

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

m. $8t(t-4)-3t(t+1)+t(t-9)=$ $8t^2-32t-3t^2-3t+t^2-9t$
$= 6t^2-44t$

n. $-6r(r-5)+8(r-3)-4(r^2-2)=$ $-6r^2+30r+8r-24-4r^2+8$
$= -10r^2+38r-16$

o. $-8(x^2-x)+5(x^2)-3x(10+2x)=$ $-8x^2+8x+5x^2-30x-6x^2$
$= -9x^2-22x$

p. $3x(7-x)-6(x^2-3x)+8x^2=$ $21x-3x^2-6x^2+18x+8x^2$
$= -x^2+39x$

q. $\dfrac{10x}{5}=$ $2x$

r. $\left(\dfrac{-35x^2}{7x}\right)=$ $-5x$

s. $\dfrac{18a^2b^2}{-6ab}=$ $-3ab$

t. $\left(\dfrac{-72m^2np^5}{-8mnp^3}\right)=$ $9mp^2$

u. $\dfrac{4x^2+3x}{x}=$ $\dfrac{4x^2}{x}+\dfrac{3x}{x}=4x+3$

v. $\dfrac{5s^3-15s^2+25s}{-5s}=$ $\dfrac{5s^3}{-5s}-\dfrac{15s^2}{-5s}+\dfrac{25s}{-5s}=-s^2+3s-5$

w. $\dfrac{18b^3-27b^2+9x}{-9x}=$ $\dfrac{18b^3}{-9x}-\dfrac{27b^2}{-9x}+\dfrac{9x}{-9x}=\dfrac{-2b^3}{x}+\dfrac{3b^2}{x}-1$

x. $\dfrac{-24a^2b+12ab-20ab^2}{4ab}=$ $-6a+3-5b$

Solving Linear Equations

1. Solve the following equations:

a. $w-3=-2$

$w=1$

b. $14-k=3$

$-k=-11$

$k=11$

c. $-2p=36$

$p=-18$

d. $121=-11p$

$p=-11$

e. $\frac{x}{7}=-6$

$x=-42$

f. $-5=\frac{40}{m}$

$-5m=40$

$m=-8$

g. $2x-12=x+3$

$x=15$

h. $6m=9+3m$

$3m=9$

$m=3$

i. $4m+11=6m-5$

$16=2m$

$m=8$

j. $5x+8-x=18$

$4x=10$

$x=\frac{10}{4}$ → $x=\frac{5}{2}$

k. $7x+3-2x=23$

$5x=20$

$x=4$

l. $3(x+2)=-3$

$3x+6=-3$

$3x=-9$ → $x=-3$

m. $3(4y-20)=3y+75$

$12y-60=3y+75$

$9y=135$ → $y=15$

n. $3(x-2)+x=2(x+1)$

$3x-6+x=2x+2$

$4x=2x+8$

$2x=8$ → $x=4$

o. $2y-5-(y-3)=7$

$y-2=7$

$y=9$

p. $5(2y-1)-3(4y-6)=7$

$10y-5-12y+18=7$

$-2y+13=7$

$-2y=-6$

$y=3$

q. $\frac{m-34}{8} = -2m$

$m - 34 = -16m$

$17m = 34$

$\boxed{m = 2}$

r. $\frac{7x}{6} - \frac{x}{3} = \frac{11}{3} - x$

$\frac{7x}{6} - \frac{2x}{6} = \frac{11}{3} - \frac{6x}{6}$

$\frac{11x}{6} = \frac{11}{3} \rightarrow 33x = 66$

$\boxed{x = 2}$

s. $\frac{d}{2} - \frac{3d}{4} = \frac{3}{4} - d$

$\frac{2d}{4} - \frac{3d}{4} = \frac{3}{4} - \frac{4d}{4}$

$\frac{3d}{4} = \frac{3}{4} \rightarrow 12d = 12$

$\boxed{d = 1}$

t. $\frac{(y-7)}{3} = \frac{(y-2)}{4}$

$4(y-7) = 3(y-2)$

$4y - 28 = 3y - 6$

$\boxed{y = 22}$

u. $\frac{(n+1)}{3} = \frac{(n-1)}{5}$

$5(n+1) = 3(n-1)$

$5n + 5 = 3n - 3$

$2n = -8$

$\boxed{n = -4}$

v. $\frac{11j-3}{10} = \frac{3j+15}{6} - 2$

$\frac{11j-3}{10} = \frac{3j+15}{6} - \frac{12}{6}$

$\frac{11j-3}{10} = \frac{3j+3}{6}$

$66j - 18 = 30j + 30$

$36j = 48 \rightarrow j = \frac{48}{36} = \boxed{\frac{4}{3}}$

w. $\frac{4k+5}{3} - \frac{3k}{2} = -k$

$\frac{2(4k+5)}{6} - \frac{3(3k)}{6} + \frac{6k}{6} = 0$

$\frac{8k + 10 - 9k + 6k}{6} = 0$

$5k + 10 = 0 \rightarrow 5k = -10$

$\boxed{k = -2}$

x. $\frac{p+1}{3} + \frac{p-2}{7} = 1$

$\frac{7p+7}{21} + \frac{3p-6}{21} = \frac{21}{21}$

$\frac{10p - 20}{21} = 0 \rightarrow 10p - 20 = 0$

$10p = 20$

$\boxed{p = 2}$

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

$\frac{n-1}{4} + \frac{8}{4} = \frac{3n}{5}$

$\frac{n+7}{4} = \frac{3n}{5}$

$5n + 35 = 12n$

$35 = 7n$

$\boxed{n = 5}$

2. Solve the following word problems: Write an equation and solution

a. The sum of two numbers is 39. One number is 7 less than the other. What are the two numbers?

$x + y = 39 \rightarrow x = 39 - y$

$x - y = 7 \rightarrow (39 - y) - y = 7$

$-2y = -32$ $\boxed{y = 16}$ $\boxed{x = 23}$

b. The difference between two numbers is 65. If the larger number is 112, what is the smaller number?

$x - y = 65$

$x = 112$

$112 - y = 65$

$\boxed{y = 47}$

c. The product of two numbers is -60. If the larger number is 15, what is the smaller number?

$xy = -60$

$x = 15$

$15y = -60 \longrightarrow \boxed{y = -4}$

d. The quotient of two numbers is -6. If the smaller number is 24, what is the larger number?

$\frac{x}{y} = -6 \qquad y = 24$

$\frac{x}{24} = -6 \qquad \boxed{x = -144}$

e. A number and one-quarter of the number total 245. What is the number?

$x + \frac{1}{4}x = 245$

$\frac{5x}{4} = 245$

$5x = 980 \longrightarrow \boxed{x = 196}$

f. One fifth of a number is added to one third of the same number. If the sum is 96, find the number.

$\frac{1}{5}x + \frac{1}{3}x = 96$

$\frac{3x}{15} + \frac{5x}{15} = 96$

$\frac{8x}{15} = 96 \longrightarrow 8x = 1440$

$\boxed{x = 180}$

g. Find three consecutive numbers whose sum is 87.

$x + (x+1) + (x+2) = 87$

$3x + 3 = 87$

$3x = 84$

$x = 28$

$\boxed{28, 29, 30}$

h. Find three consecutive inters whose sum is -147.

$x + (x+1) + (x+2) = -147$

$3x + 3 = -147$

$3x = -150$

$x = -50$

$-50, -49, -48$

i. The length of a rectangle is 8cm more than the width. If the perimeter is 64cm, find its dimensions.

$l = w + 8$

$l + l + w + w = 64$

$(w+8) + (w+8) + w + w = 64$

$4w + 16 = 64$

$4w = 48$ → $w = 12 \quad l = 20$

j. The perimeter of a rectangular plot is 114m. If the length is 3m less than three times the width, find the dimensions.

$l + l + w + w = 114$

$l = 3w - 3$

$(3w-3) + (3w-3) + w + w = 114$

$8w - 6 = 114$ → $8w = 120$

$w = 15$

$l = 42$

k. A rectangle is 5cm longer than twice its width. The width of another rectangle is 3cm less than the width of the first rectangle and its length is 6cm more than 3 times its width. If the perimeters are equal, find the dimensions of both rectangles.

$l = 2w + 5$ $\quad w_2 = w - 3$ $\quad l_2 = 3w_2 + 6$

$l + l + w + w = l_2 + l_2 + w_2 + w_2$

$(2w+5) + (2w+5) + w + w = (3w_2 + 6) + (3w_2 + 6) + w_2 + w_2$

$6w + 10 = 8w_2 + 12$

$6w - 2 = 8(w-3)$

$6w - 2 = 8w - 24$

$22 = 2w$

$w = 11$ $\quad l = 27$

$w_2 = 8$

$l_2 = 30$

l. Rita has two more dimes than quarters. If she has $3.35 altogether, how many of each type of coin does she have?

$d = q + 2$

$0.10d + 0.25q = 3.35$

$0.10(q+2) + 0.25q = 3.35$

$0.10q + 0.20 + 0.25q = 3.35$

$0.35q = 3.15$

$q = 9 \quad d = 11$

m. A cash box has seven times as many dimes as quarters. The total value in the box is $8.55. How many of each coin are there?

$d = 7q$

$0.10d + 0.25q = 8.55$

$0.10(7q) + 0.25q = 8.55$

$0.70q + 0.25q = 8.55$

$0.95q = 8.55$

$q = 9$

$d = 63$

n. Abigail, Jerome and Klaus were given a total of $2750 in scholarships. Klaus received 3 times the amount Abigail received. Jerome received $250 more than Abigail. How much did each student receive?

$a + j + k = 2750$

$k = 3a$

$j = a + 250$

$a + (a + 250) + 3a = 2750$

$5a = 2500$

$a = \$500$

$k = \$1500$

$j = \$750$

o. To stay in shape you workout at the Commonwealth Pool. Your annual (1 year) pass is $280.00. You also pay an additional $5.00 for every specialty class (x) that you attend. If you attended 22 specialty classes throughout the year, what is your yearly cost?

$C = 280 + 5x$

$C = 280 + 5(22)$

$C = 280 + 110 = \$390$

p. Your monthly cell phone charge is $40.00 for unlimited local calling. You also pay an additional 0.15¢ for each minute (m) that you call long distance. What is the amount of your monthly cell phone bill if you have spent 60 minutes talking long distance?

$C = 40 + 0.15m$

$C = 40 + 0.15(60)$

$C = 40 + 9 = \$49$

q. The flying distance between two cities is 2175 km. If this distance on a map is 15cm, how many km does each cm represent?

$\frac{2175}{15} = 145$

1 cm = 145 km

r. The CN Tower in Toronto is 553.3m tall. A LEGO version of the CN Tower was created using a scale factor of 1:184. What is the height of the model, rounded to the nearest metre?

$\frac{1}{184} = \frac{x}{553.3}$

$553.3 = 184x$

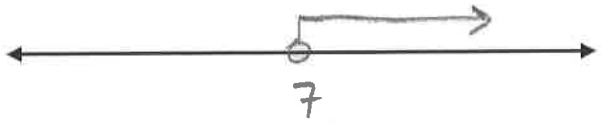
$x = 3.01\text{ m}$

Linear Inequalities

1. Solve and graph the following inequalities:

a. $x-5>2$

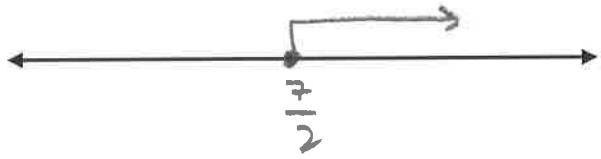
$x > 7$



b. $6x-12 \geq 9$

$6x \geq 21$

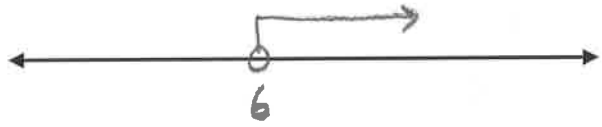
$x \geq \frac{7}{2}$



c. $3y+12<5y$

$-2y < -12$

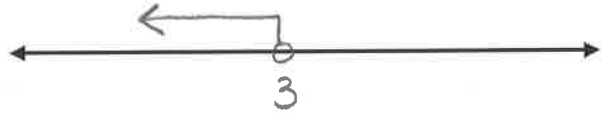
$y > 6$



d. $5x-5<7+x$

$4x < 12$

$x < 3$

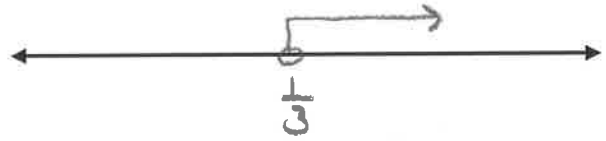


e. $6(y-2)>3y-11$

$6y-12 > 3y-11$

$3y > 1$

$y > \frac{1}{3}$

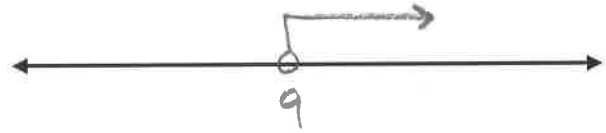


f. $2(x+3)<3(x+5)$

$2x+6 < 3x+15$

$-x < 9$

$x > 9$



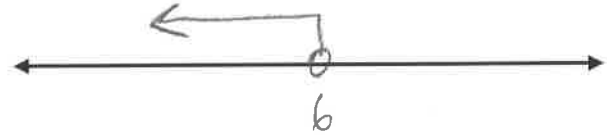
g. $15-x>2(-3+x)+3$

$15-x > -6+2x+3$

$15-x > 2x-3$

$-3x > -18$

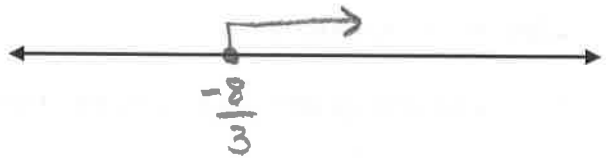
$x < 6$



h. $\frac{-3b}{4} \leq 2$

$-3b \leq 8$

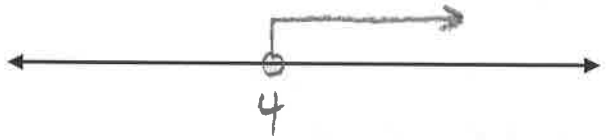
$b \geq \frac{-8}{3}$



i. $6 < \frac{3y}{2}$

$12 < 3y$

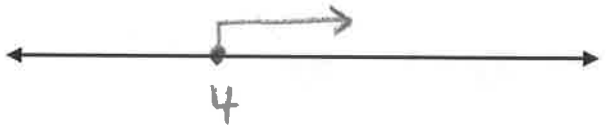
$4 < y$ $\quad y > 4$



j. $\frac{8+r}{4} \geq 3$

$8 + r \geq 12$

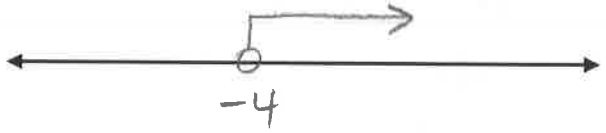
$r \geq 4$



k. $-2 < \frac{n-2}{3}$

$-6 < n - 2$

$-4 < n$ $\quad n > -4$



l. $-14 + \frac{p}{8} \geq -18$

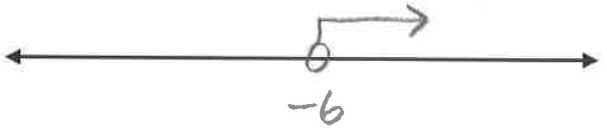
$\frac{p}{8} \geq -4$

$p \geq -32$

m. $-3 + \frac{k}{3} > -5$

$\frac{k}{3} > -2$

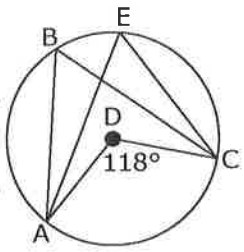
$k > -6$



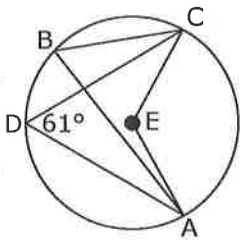
Circle Geometry

1. Solve for the indicated angles:

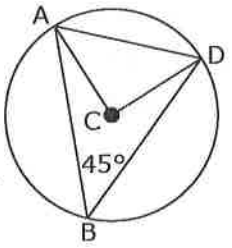
a. $\angle ABC =$ 59°
$\angle AEC =$ 59°



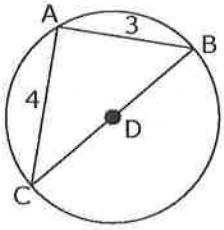
b. $\angle ABC =$ 61°
$\angle AEC =$ 122°



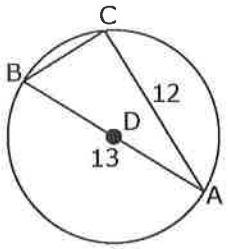
c. $\angle ACD =$ 90°
$\angle ADC =$ 45°



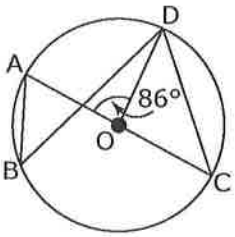
d. $\angle CAB =$ 90°



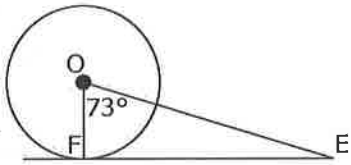
e. $\angle BCA =$ 90°



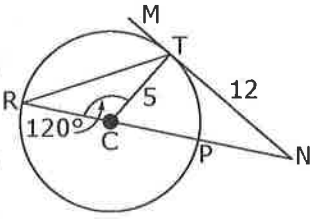
f. $\angle ACD =$ 43°
$\angle ABD =$ 43°



g. $\angle EFO =$ 90°
$\angle FEO =$ 17°



h. $\angle CTN =$ 90°
$\angle NCT =$ 60°
$\angle CNT =$ 30°
$\angle CTR =$ 30°



2. Define the following terms:

a. Chord – a line segment connecting two points on a circle.

b. Inscribed Angle – an angle whose vertex sits on the 'edge' of a circle and whose rays intersect the circle

c. Central Angle – an angle whose vertex is the origin and whose rays intersect the circle

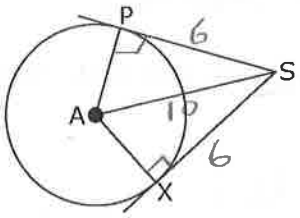
d. Perpendicular Bisector – a line that meets another line at a 90° angle while cutting it in half

e. Tangent Line – a line that intersects a circle at one point

f. Point of Tangency – the intersection point between a circle and its tangent.

3. Solve for the indicated side length:

a. In the diagram, SP is tangent to the circle at P. SX is tangent to the circle at X. SP = 6 cm, SA = 10 cm, and A is the centre of the circle. What is the length of AX?

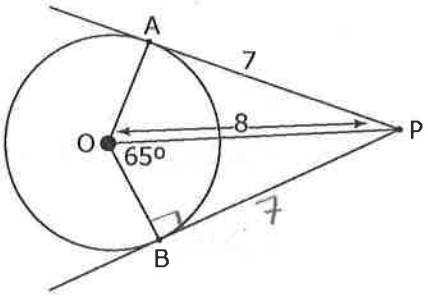


$10^2 - 6^2 = (AX)^2$

$64 = (AX)^2$

$AX = 8\text{ cm}$

b. The centre of the circle is O. Points A and B are tangent to the circle. What is the length of $\overline{OB}$?

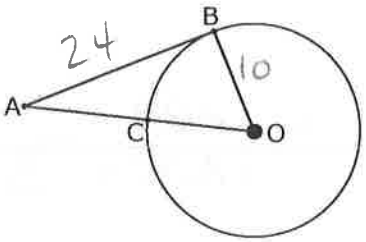


$8^2 - 7^2 = (OB)^2$

$15 = (OB)^2$

$OB = \sqrt{15}$

c. In the diagram, $\overline{AB}$ is tangent to the circle. The length of $\overline{AB}$ is 24 cm and the length of $\overline{OB}$ is 10 cm. What is the length of $\overline{AO}$ and what is the length of $\overline{AC}$?

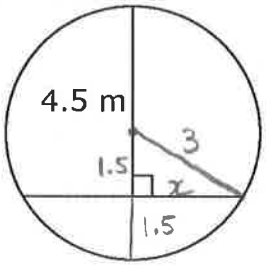


$(AO)^2 = 10^2 + 24^2$

$AO = 26\text{ cm}$

$AC = AO - OC = 26 - 10 = 16\text{ cm} = AC$

d. A subway track must pass through a cylindrical tunnel. The tunnel is 6 m in diameter. How wide should the track bed be so that the maximum height at the centre of the tracks is 4.5 m? Express your answer to the nearest tenth of a metre.



$3^2 - 1.5^2 = x^2$

$x = 2.6\text{ m}$

Track bed $= 2 \cdot 2.6 = 5.2\text{ m}$