Grade 9 Academic Mathematics – Exam Review

Relationships

1. Calculate

a) $-3-(-8)$ b) $-6-(-14)$ c) $-5-14$

d) $7-(-3)(4)$ e) $\dfrac{(-6)(-5)}{(-2)(-3)}$ f) 10.5% of 124

g) 140% of 250 h) 80% of what number is 42?

2. The table shows the diameter of White Pine trees at various ages.

Age (years)	Diameter (cm)
13	**6**
20	**12**
28	**17**
42	**22**
54	**29**
63	**40**
83	**44**
88	**47**
99	**50**
104	**54**
120	**57**
130	**61**

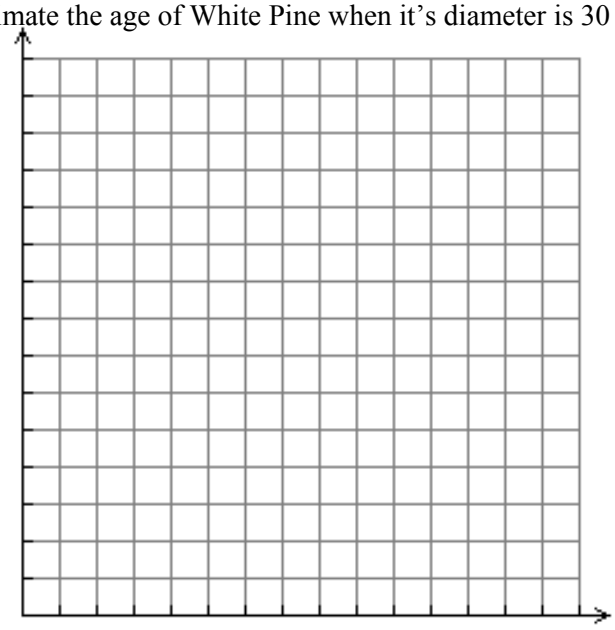
a) Create a scatterplot for the data.

b) Estimate the equation of the line of best fit.

c) What does the slope of the line of best fit represent? Explain.

d) Approximate the diameter of a 50 year old White Pine.

e) Estimate the age of White Pine when it's diameter is 30 cm.



3. Jaime has a drinking glass in the shape of a cylinder. The radius of the base of the glass is 5 cm, and the height is 12 cm.

a) If the glass were full of water, what would be the volume of water in the glass?

Recall: Volume of a cylinder = _____

b) If the height of the water in the glass were 7 cm, what would be the volume of water in the glass?

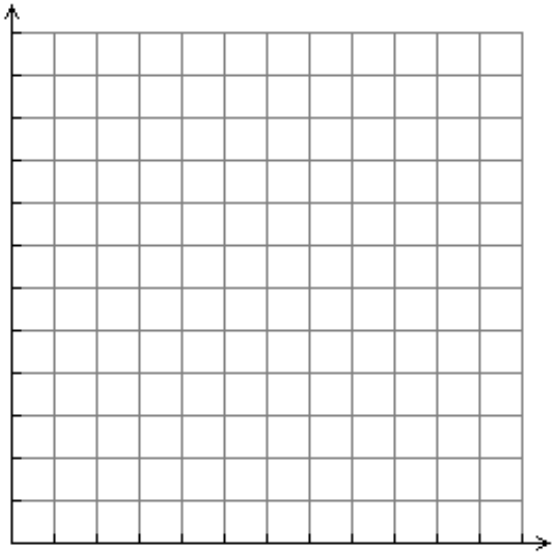
c) Complete the following table.

Height of Water (cm)	Volume of Water (cm^3)	First Differences
2		/ / / / / / / / / / / / /
4		
6		
8		
10		

d) Based on the chart above, would you say that the data is linear or non-linear? Explain your answer.

e) Explain the difference between discrete and continuous graphs. Which is appropriate for his data?

f) Draw a fully labeled graph of the height of water versus the volume of water in Jaime's glass.



Powers and Roots

1. Evaluate. Show all steps.

a) 3^5 b) $(-2)^7$ c) 3^3 d) $\left(5^2\right)^3$

e) $\left(3^4\right)\left(3^5\right) \div \left(3^3\right)^2$ f) -7^2 g) $\left(-6\right)^2$

2. Express the first number as a power of the second number.

a) 64, 2 b) 27, 3 c) $\frac{1}{81}$, 3

3. Express as a single power, then evaluate. Write each answer with NO DECIMALS.

a) $(2^3)(2^5)$ b) $(5^{-6})(5^8)$ c) $\frac{8^{10}}{8^{12}}$ d) $\frac{10^{10}}{10}$

e) $(2^2)^3$ f) $10^5 \div 10^{-3}$

6. Evaluate. Show steps.

a) $(2^2)^4 - (3^2)^2$ b) $(10^2)^5 - (10^3)^3$ d) $-(10^2) - (10^3)^2$

e) $\frac{(8^6)(8^3)}{8^4}$ f) $\frac{(7^2)(7^5)}{7^3}$

Square Roots and Pythagorean Theorem

1. Determine the perimeter of a square with an area of 49 cm^2.

2. A ladder, 8.2 m long, is placed with its foot 1.8 m from a wall. How high up the wall will the ladder reach?

5. When on a hike, Jeanne cuts diagonally across a large rectangular field, 1.6 km by 3.0 km, instead of keeping to the sides. What distance does she save?

Slope and Lines

1. Fill in the blanks.

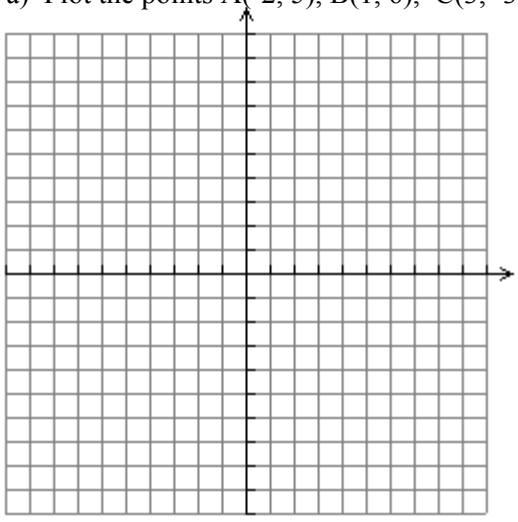
   a) The Cartesian plane is divided into four _____. The area where the x-coordinate is positive and the y-coordinate is negative is the _____ _____.

   b) The line defined by $y = 3$ is parallel to the ___-axis.

   c) The point (0, 0) is called the _____ _____.

   d) The line $5x - 7y = 35$ crosses the y-axis at _____.

2. a) Plot the points A(-2, 5), B(1, 6), C(3, -3) and D(3, -8).



b) Determine the slope of the line through AB.

c) Determine the slope of the line through CD.

3. A roof has a slope of $\frac{3}{4}$. What happens to the roof if the run is decreased?

4. Oliver ran 150 m in 22 s at the provincial track meet. Suppose the point (22, 150) was plotted on a distance-time graph and connected to the origin with a line segment. What would the slope of this line segment represent?

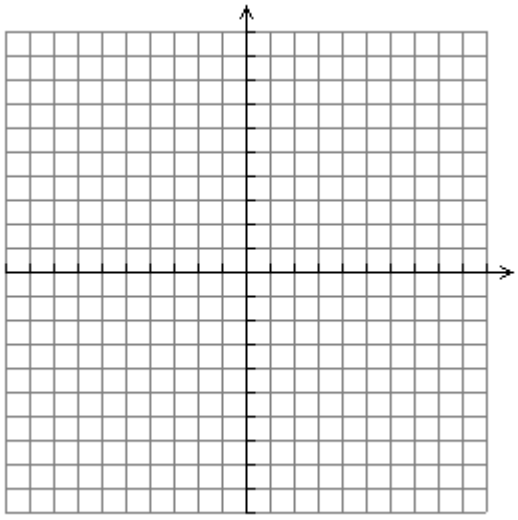
5. Sketch a time-distance graph to represent the following story.

Ivana runs from home to her friend's house for 30 minutes at a constant rate of 8 km/h. She visits her friend for 1 hour and then walks home at a more leisurely constant rate of 4 km/h.

6. The slope of line segment EF is $\frac{-2}{3}$. The coordinates of the endpoints are E(4, 0) and F(-2, y).

Determine the value of y.

7. Graph a line segment through the point (-2, 1) that has a slope of $\frac{-3}{5}$.



8. i) Complete each table of values.

a)

a) $y = -3x + 5$	

b)

b) $y = 2x^2 + 1$	

c)

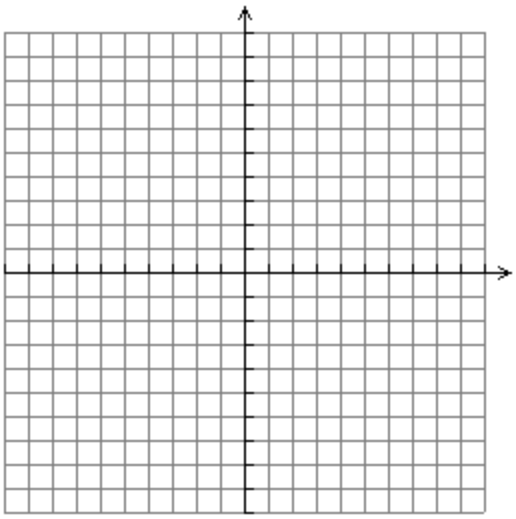
c) $2x - y + 6 = 0$	

ii) Does each equation represent a linear or non-linear relation? Explain.

9. State the slope and y-intercept of the line represented by each equation.

	Equation	Slope	y-intercept
a)	$y = -5x + 6$		
b)	$y = \frac{1}{3}x$		
c)	$x = -4$		
d)	$y = 5$		
e)	$3x - 4y = 24$		

10. Graph the line represented by each equation.

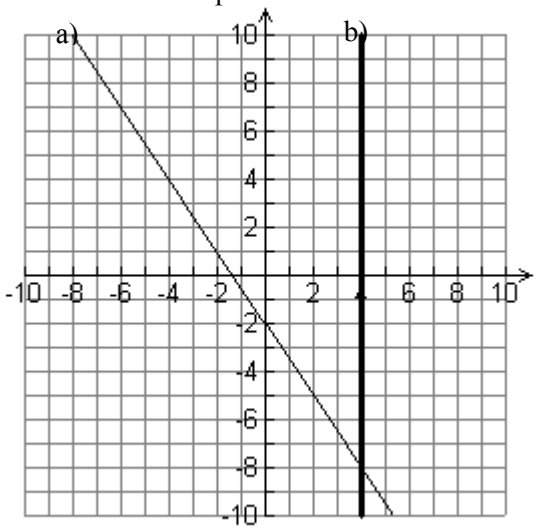


a) $y = 3x - 4$

b) $y = \frac{1}{4}x + 3$

c) $y = 3$

11. Determine the equation of each line.



a) _____

b) _____

12. Does the point (5, -1) lie on the line $y = \frac{-2}{5}x + 1$? Explain.

Polynomials

1. Simplify:

a) $5x + 6 + 7x + 1$ _____

b) $4x^2 + 5x + 7 - 2x^2 - 4x - 1$ _____

c) $5y^2 - 2y - 7 - 4y^2 + 5y + 3$ _____

d) $-7a^2 - 2a - 8a - 4a^2$ _____

2. Given the polynomial $5x^4 - 6x^3 + 8x - 4$:

a) the constant is _____

b) the coefficient of the second term is _____

c) the number of terms is _____

3. Evaluate if $x = -3$ and $y = 8$:

a) $2x + y$ b) $3x^2$ c) $(2x)^2$

4. Expand:

a) $-3(y - 10)$ b) $3x(x^2 + 9xy)$ c) $-(x^2 + 7x - 2)$

5. Expand and simplify:

a) $3 - 2(x - 4)$ b) $x(x - 10) + 2(4x)$ c) $\frac{-(x+4)}{3} + \frac{x-1}{5}$

6. Simplify:

a) $(4x^2 y^3)(-3x^5 y)$ b) $\frac{24a^3 b}{-6ab}$ c) $(-8xyz)(-5x^2 y)$ d) $(-12x^6) \div (2x^4)$

7. Expand and simplify:

a) $(8x^2 + 5x - 7) + (15x^2 - 9x - 18)$ b) $(6y^2 - 4y - 2) - (3y^2 - 5y + 1)$

c) $5y(2x - 4y) - 3x(2y - 5)$ d) $7ab(5a^3 - b) + 3a(a^2 b - b^2)$

Solving Equations

1. Solve:

a) $3x - 11 = 4$ b) $-x + 6 = -22$

c) $2x - 6 = 12 - x$ d) $6(x - 4) = 2x + 3(x - 1)$

e) $\frac{2x-1}{5} = 7$ f) $\frac{x}{3} = \frac{x}{2} + 9$

g) $4(5x + 1) = 9 - 4(1 - 3x)$ h) $\frac{5x}{6} + \frac{3}{8} = \frac{x}{4} - \frac{2}{3}$

2. Determine where the lines $y = 3x - 13$ and $y = \frac{1}{2}x - 3$ intersect. Check the solution.

3. Members of the school band sold chocolate bars to raise money. Kevin sold twice as many bars as Oliver. They sold a total of 48 bars. How many did each boy sell?

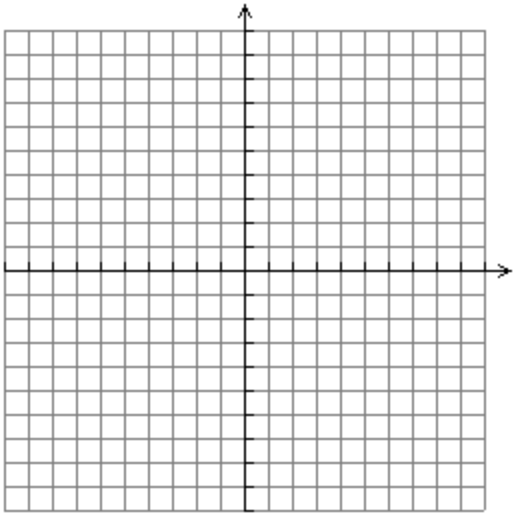
4. Find four consecutive integers so that if the first is increased by 2, the second decreased by 2, then the third multiplied by 2, and the fourth divided by 2 then the sum of the four resulting numbers is 200?

5. The length of a rectangular pool is 28.5 m greater than its width. The perimeter of the pool is 143 m. What are the dimensions of the pool?

6. There are equal numbers of nickels, dimes, and quarters. Their total value is $4.00. How many of each kind of coin are there?

Analytic Geometry

1. Find the slopes of the line segments joining the following pairs of points:
   a) A(1, -1) and B(-3, 3) b) C(4, -1) and D(4, -6)



2. The following questions refer to points
   P(0, 0), Q(5, -6), R(3, 0), S(-2, 7), A(-3, 1), B(-1, 5) and C(5, 2).

a) Graph the lines through PQ and RS and determine if they are parallel.

b) Graph A, B, and C and connect them to form a triangle. Determine if ΔABC is a right triangle.

3. Prove that the following points are the vertices of a right angled triangle.

   i) A(-2, 5), B(6, 8), C(1, -3)

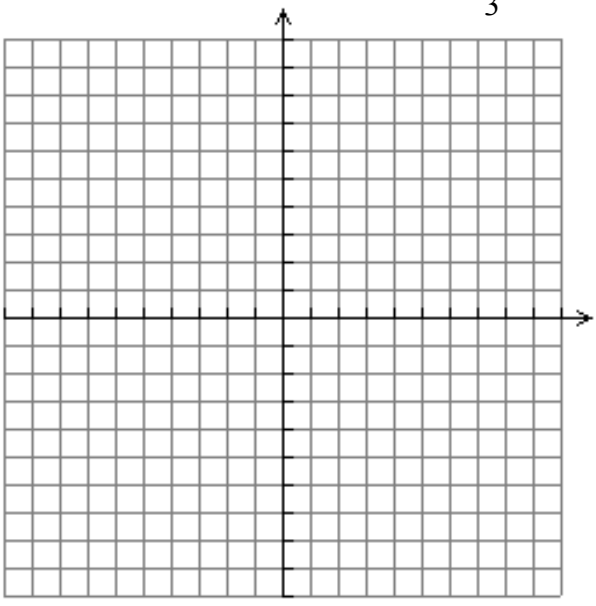
   ii) P(-6, 1), Q(-2, -7), R(-4, -8)

Slopes, Intercepts and Equations

1. Sketch all three lines on the axes below, using the method indicated.

a) Table of Values b) **Slope/y-intercept** c) **Intercepts**

$y = -2x + 5$ $y = \frac{2}{3}x - 1$ $2x + 3y = 12$



2. Determine whether the given point lies on the given line:

   a) (2, 5) $y = 2x + 1$ b) (2, -3) $4x - y = 10$

   c) (-2, 4) $3x - 2y + 14 = 0$ d) (-2, 4) $x + y + 2 = 0$

3. The equation of any linear relation can be written as $y =$ _____. Therefore, in order to determine the equation of a linear relation, you only need to know the value of the _____ and the _____.

4. Complete the chart:

Equation of Given Line	**Slope of Given Line**	**y-intercept**	**Slope of any line p*arallel* to given line**	**Slope of any line p*erpendicular* to given line**
$y = \frac{-2}{3}x + 3$				
$x + 5y - 15 = 0$				
	5	-1		
		4		$\frac{2}{3}$
		-2	2	

5. Determine the x-intercept, y-intercept and slope of the following lines:

a) $2x + y - 4 = 0$ b) $x + 3y + 6 = 0$

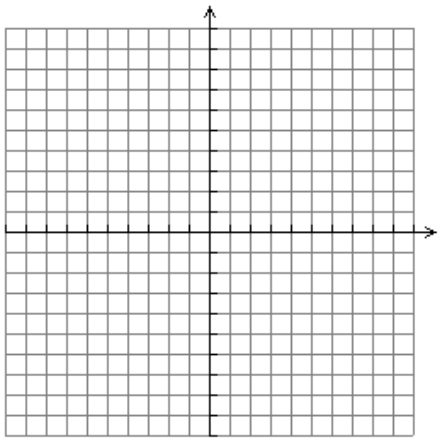
6. Determine the equations of the following lines:

a) through the points A(2, 3) and B(1, 5)
b) through the point A(-1, 3) with a slope of $-\frac{1}{3}$
c) through the point A(3, 2) and parallel to the line $y = 5x - 7$
d) through the point A(-1, 5) and perpendicular to the line $y = -4x + 1$
e) through the point P(-2, 5) and parallel to the line $3x - 2y = 9$
f) with a *y*-intercept of 8 and passing through P(2, 3)
g) with an *x*-intercept of 7 and a *y*-intercept of 2
h) with an *x*-intercept of –3 and perpendicular to the line $2x + 3y = 8$

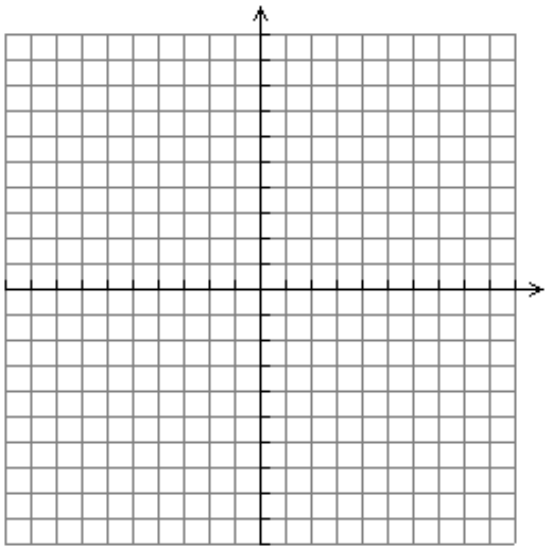
7. Determine the equation of the line with *y*-intercept of 5 that is:
a) parallel to $3x - y - 5 = 0$ b) perpendicular to $2x + y + 4 = 0$

8. Sketch the following pairs of lines on the same set of axes. Use a **table of values** or the **slope/y-intercept method**. Label the point where the lines intersect. How can you check that this is the point of intersection of the two lines?

$2x - y = 12$ $y = -x$



9. On the same set of axes, draw lines through the following points.



a) $X(-2,-1)$ with slope $-\frac{4}{3}$.

b) $Y(3,-2)$ parallel to the line in part (a).

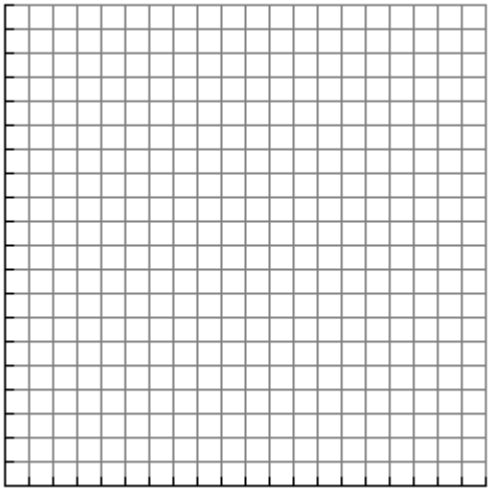
c) $Y(3,-2)$ perpendicular to the line in part (a).

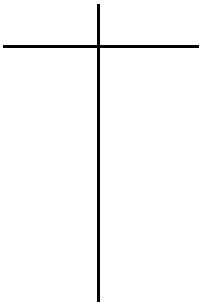
10. Candies are placed in a box. The mass of the empty box is 20 g. The mass of each candy is 5 g.

Let *t* grams represent the total mass of the box and the candies.
Let *n* represent the number of candies.

a) Write an equation for the relation between the total mass, *t*, and the number of candies, *n*.

b) Graph the relation.





c) Should the points be joined? ***Explain.***

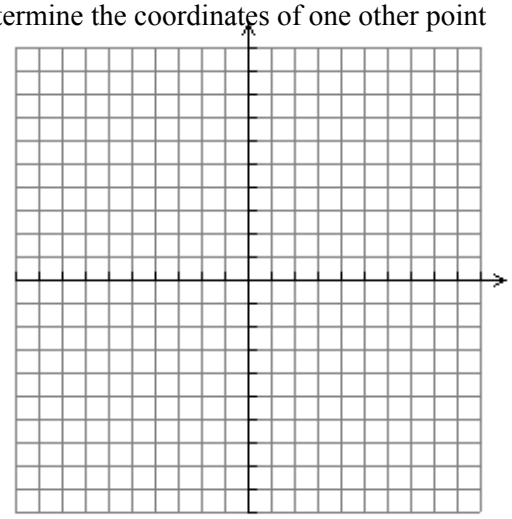
d) Determine the slope and *t*-intercept of the graph.

e) What does the slope represent? What are the units for slope?

f) What does the slope tell you about the rate of change of *t*?

12. Determine an equation of the line that passes through the points C(1, 4) and D(4, -2).

13. By drawing a line through the point B(1, -3) with a slope of $-\frac{1}{2}$, determine the coordinates of one other point that lies on the line.



14. State the slope and y-intercept of each of the following.

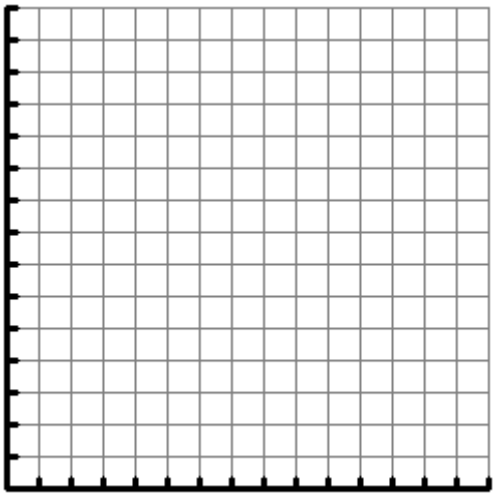
a) $4x+2y-7=0$ b) $3x-5y=9$

15. Express each of the following in standard form.

a) $y = 2x - 1$ b) $y = \frac{2}{3}x - 5$ c) $y = -\frac{4}{5}x + 5$

16. The Barko Publishing Company specializes in printing student yearbooks. An order of 400 books costs $3000. An order of 600 books costs $4000.

a) Plot a graph of this relation.



b) Find an equation of this relation expressing cost in terms of the number of books ordered.

c) What quantity does the slope of the relation represent?

d) From the equation determine the cost of 300 books.

e) If an order costs $3500, how many books were ordered?

f) Determine the y-intercept of the relation.

g) What meaning does the y-intercept have?

Measurement

1. Calculate the surface area and the volume of the following:
   a) a rectangular prism of height 3 m, width 12 m and length 10 m.
   b) a cylinder of height 8 cm, diameter of base 12 cm.
   c) a cone of height 16 m and radius of the base 5 m.

2. If the height of a rectangular prism is 10 cm, the width is 22 cm and the volume is 380 cm^2, find the length, rounded to one decimal place.

3. If the height of a cylinder with volume 58 m^2 is 8 m, find the radius to one decimal place.

4. the radius of a cylinder with volume 150 cm^2 is 12 cm, find the height to one decimal place.

5. You want to construct a rectangular pool in your backyard with a water surface area of 60 m^2. The pool will be built in the back corner of your lot so that it will be bordered on two sides by a fence. You will make a walkway on the other two sides by a fence. You will make a walkway on the other two sides of the pool. Minimize the number of tiles that will be used.

Area (m^2)	Width (m)	Length (m)	Perimeter (m)