

## Unit 1: Square Roots and Surface Area

**Note:** Unless otherwise stated, give all measurements to the nearest tenth of a unit.

1. a) Give an example of two rational numbers (one fraction and one decimal) that are perfect squares. Write their square roots.

- b) Give an example of two rational numbers (one decimal and one fraction) that are not perfect squares. Explain how you know they are not perfect squares.

- i) Use benchmarks to approximate the square root of each number.  
Write the answer to the nearest tenth.

- ii) Use a calculator to approximate the square root of each number.  
Write the answers to the nearest hundredth.

2. Which numbers below are perfect squares and have square roots between 3 and 4?  
Explain how you know.

a) 10.24

b)  $\frac{49}{4}$

c) 12.25

d)  $\frac{221}{16}$

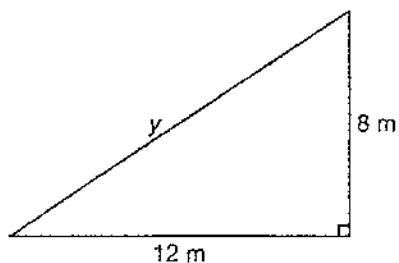
3. Find a fraction and a decimal between 0.5 and 0.7 that are perfect squares. Explain how you found them.

4. a) Use benchmarks to estimate  $\sqrt{55}$  to the nearest tenth. Explain how you know.

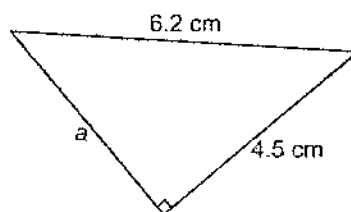
- b) Use a calculator to estimate  $\sqrt{55}$  to the nearest hundredth.

5. Calculate the length of the indicated side in each triangle.

a)

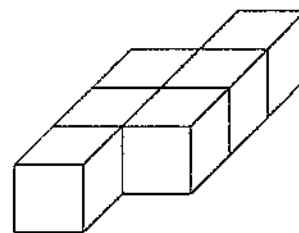


b)



6. The object at the right is constructed using linking cubes. Each face of a cube has an area of  $1 \text{ unit}^2$ .

- a) Describe or show on the diagram where there are overlapping faces.



- b) Determine the surface area of the composite object.

7. Determine the surface area of the composite object at the right.

8. Use the diagram on the right. The triangular prisms are congruent. Here is a student's work to determine the surface area of the composite object. Describe any errors and show a correct solution.

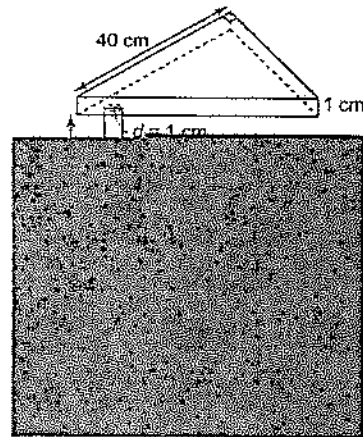
Triangular Prisms:

$$(4)\left(\frac{1}{2}\right)(40)(30) + 50(1)(2) + 30(1)(2) + 40(1)(2) = 2640$$

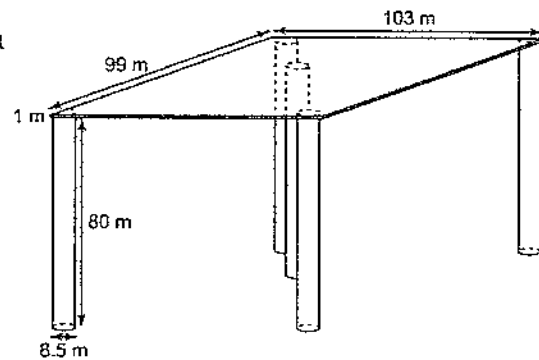
Cylinder:

$$\pi(1)(60) = 188.5$$

Total surface area:  $2828.5 \text{ cm}^2$



9. The diagram at the right shows part of a platform for off-shore drilling. All the exposed surfaces (top and bottom) are to be prepared for use. Determine the surface area of the platform.



## Unit 2: Powers and Exponent Laws

1. Complete this table.

Power	Base	Exponent	Repeated Multiplication	Standard Form
$3^5$				
$(-2)^4$				
	10	3		
			$-(2 \times 2 \times 2 \times 2 \times 2 \times 2)$	

2. Write as a power of 10.

a) ten \_\_\_\_\_

b)  $10 \times 10 \times 10 \times 10$  \_\_\_\_\_

c)  $-1$  \_\_\_\_\_

d) 10 000 000 \_\_\_\_\_

3. Write each expression as a product or quotient of powers.

a)  $(2 \times 3)^5$  \_\_\_\_\_

b)  $\left(\frac{1}{3}\right)^2$  \_\_\_\_\_

c)  $(12 \div 4)^3$  \_\_\_\_\_

4. Write each power of a power as a single power, then evaluate it.

a)  $(9^8)^0$  \_\_\_\_\_

b)  $[(-2)^4]^2$  \_\_\_\_\_

c)  $-(3^2)^3$  \_\_\_\_\_

5. Write each expression as a power, then evaluate it.

a)  $3^3 \times 3^2$

b)  $(-2)^4 \times (-2)^0$

c)  $5^{11} \div 5^{10}$

d)  $10^8 \times 10^2 \div 10^6$

e)  $\frac{(-3)^5 \times (-3)^6}{(-3)^7 \times (-3)^1}$

6. a) For each pair of powers, which power is greater?

i)  $8^3$  or  $3^8$  \_\_\_\_\_ ii)  $2^{10}$  or  $10^2$  \_\_\_\_\_ iii)  $5^1$  or  $1^5$  \_\_\_\_\_

b) How could you answer part a without calculating the value of both powers?

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7. a) Evaluate each power.

i)  $-2^4$  \_\_\_\_\_ ii)  $(-2^4)$  \_\_\_\_\_ iii)  $(-2)^4$  \_\_\_\_\_

b) Explain why all the powers in part a do not have the same value.

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8. Evaluate each expression. Show your work.

a)  $(-14 - 6)^2 + 11$

b)  $8 \div (-2) + (4 \times 2)^2$

c)  $[7 - (-3)]^4 - (30 \div 6)^4$

d)  $[(4 - 10)^3 \times (3 + 3)^5]^0$

e)  $(6 - 8)^5 \div (-4)$

f)  $-40 - (8 - 3)^3$

g)  $2^4 \times 2^1 - 2^3 \times 2^2$

h)  $4^2 \times 4 + 3^3 \times 3^2$

i)  $(-4)^3 \div (-4)^2 \times (-4)^0 + (-4)^2 \div (-4)$

9. Insert brackets to make this equation correct.

$$5 \times 4^2 - 2^3 + 3^3 \div 3 = 49$$

10. Both Hayley and Gavin evaluated this expression:  $(-3^4 \times 4 - 1) \div (-5)^2$   
Hayley's answer was 13 and Gavin's answer was -13.  
Who is correct?  
What is the likely error the other student made?

11. One square metre measures 1 m by 1 m.

- a) Write  $1 \text{ m}^2$  in square centimetres as a product of powers and as a single power.

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- b) Write  $1 \text{ m}^2$  in square millimetres as a product of powers and as a single power.

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12. Simplify, then evaluate each expression. Show your work.

a)  $[(-3)^3]^3 \times [(-4)^0]^3 - [(-3)^5]^0$       b)  $[(-4) \times (-5)]^4 + [(-4)^2]^2 - [(-2)^8 \div (-2)^7]^3$

13. On a test, Randy used his calculator to evaluate this expression:  $\frac{9^4}{9^2 + (-9)^2}$

The answer that was displayed was 162.

- a) Is this answer correct? \_\_\_\_\_

- b) If your answer is no, what error did Randy make? \_\_\_\_\_

- c) Show the solution to the problem to verify your answer in part a.

## Unit 3: Rational Numbers

Do *not* use a calculator for questions 1 to 8.

1. Which of the following rational numbers are equal to  $-\frac{5}{4}$ ?

$$\frac{-5}{4}, \frac{-5}{-4}, \frac{10}{8}, \frac{5}{-4}$$

2. Sketch a number line and mark each rational number on it. Order the numbers from greatest to least.

$$-3.1, \frac{5}{3}, -1.2, -\frac{1}{7}, 0.6$$

3. In each pair, which number is greater? Explain your answer.

a)  $-\frac{6}{5}, -\frac{5}{6}$

b)  $-3.\overline{32}, -3.32$

4. Determine each sum or difference.

a)  $-\frac{3}{5} + \left(-\frac{2}{3}\right)$

b)  $2\frac{3}{8} - \left(-1\frac{1}{4}\right)$

c)  $-4.1 - 3.5$

d)  $-53.9 - (-19.4)$

5. Predict which expression has the greater value. Explain your reasoning. Evaluate the expressions to check your prediction.

$$\frac{3}{4} \times \left(-\frac{1}{2}\right)$$

$$\frac{3}{4} \div \left(-\frac{1}{2}\right)$$

6. Evaluate.

a)  $-\frac{1}{4} \times \left(-\frac{3}{5}\right)$

b)  $\frac{5}{6} \div \left(-\frac{2}{3}\right)$

c)  $(-0.32) \div 1.6$

7. These are the second, third, and fourth terms in a pattern: 3, -2,  $\frac{4}{3}$

Each term can be found by dividing the previous term by  $-\frac{3}{2}$ .

a) Determine the next two terms in the pattern.

b) What is the first term in the pattern? Explain how you determined it.

8. Evaluate.

a)  $0.84 \times (-0.5) - (-2.3)$

b)  $\left(-\frac{1}{2}\right) + \frac{3}{5} \div \left[\frac{9}{10} - \left(-\frac{3}{5}\right)\right]$



9. The following temperatures were recorded at the Port Hardy, B.C. airport at noon in one week:

$-2.3^{\circ}\text{C}$ ,  $-4.2^{\circ}\text{C}$ ,  $-1.4^{\circ}\text{C}$ ,  $0.5^{\circ}\text{C}$ ,  $1.3^{\circ}\text{C}$ ,  $-0.7^{\circ}\text{C}$ ,  $-3.8^{\circ}\text{C}$

a) What was the mean temperature at noon that week to the nearest tenth of a degree?

b) The mean temperature for that month was  $-6.8^{\circ}\text{C}$ .

Is the mean temperature for the week in part a greater than or less than the mean monthly temperature?

By how much is the mean temperature for the week greater than or less than the mean monthly temperature?

10. Evaluate. Round the answer to the nearest hundredth if necessary. Explain how you used the order of operations in each part.

a)  $-5\frac{2}{5} \div \left[ \left( -\frac{1}{8} \right) + 4\frac{1}{2} \right] + \left( -2\frac{2}{7} \right)$

b) 
$$\frac{-8.6 \times 14.6 - 5.3 \div [(-19.4) - 8.6]}{(-2.9) \times 6.3 - (-9.5)}$$

## Unit 4: Linear Relations

1. Complete the table of values for each linear relation.

a)  $y = 2x - 1$

$x$	$y$
1	
2	
3	
4	
5	

b)  $y = -3x + 2$

$x$	$y$
-2	
0	
2	
4	
6	

c)  $x + 2y = 10$

$x$	$y$
2	
4	
6	
8	
10	

2. Graph each linear relation. Explain your work or show it.

a)  $y = x - 6$

b)  $x + 3 = 0$

c)  $2y - 3 = 6$

d)  $2x + y = 6$

3. Drew can type 30 words per minute. He has to type a 2500-word essay.

a) Create a table that shows the number of words that remain after Drew has typed for up to 5 min.

b) Write an equation that relates the number of words remaining,  $W$ , to the number of minutes,  $n$ , that Drew has typed.

c) Drew types for 40 min. How many words does Drew have left to type?

d) Drew has 640 words left to type. For how long has he been typing?

4. The pattern in each table below continues. For each table:
- Describe the pattern that relates  $v$  to  $t$ .
  - Write an equation that relates  $v$  to  $t$ .
  - Verify your equation by substituting values from the table.

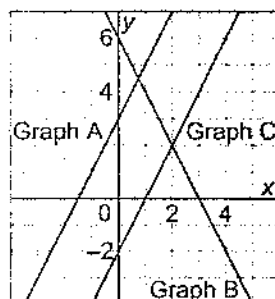
a)

Term Number $t$	Term Value $v$
1	7
2	11
3	15
4	19

b)

Term Number $t$	Term Value $v$
1	17
2	14
3	11
4	8

5. Match each equation with a graph on the grid below. Justify your answers.
- a)  $2x + y = 6$       b)  $2x - y = 2$       c)  $y = 2x + 3$



6. The sum of two numbers is 7. Let  $x$  and  $y$  represent the two numbers.

a) Complete a table for values of  $x$  from 5 to 10.

b) Graph the data. Should you join the points? Explain.

c) Write an equation that relates  $x$  and  $y$ .

d) Determine the value of  $x$  when  $y = -5$ .

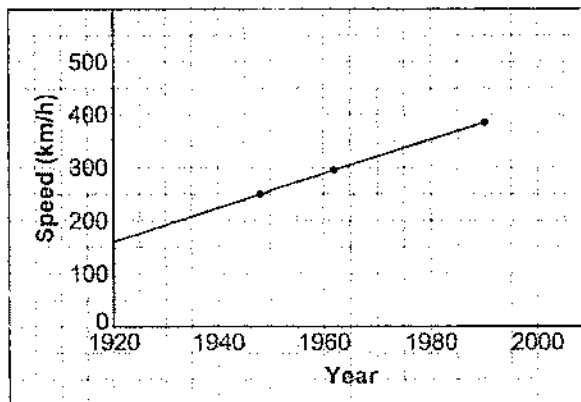
Did you interpolate or extrapolate? Explain.

e) Determine the value of  $y$  when  $x = 8$ .

Did you interpolate or extrapolate? Explain.

7. The graph shows how the maximum speed for production cars has changed over time.

Maximum Speeds for Production Cars



a) Estimate the maximum speed of a production car in 1960.

Is this interpolation or extrapolation? Explain.

b) Estimate the maximum speed of a production car in 2010.

c) Predict when the maximum speed will reach 500 km/h.

What assumptions are you making?

## Unit 5: Polynomials

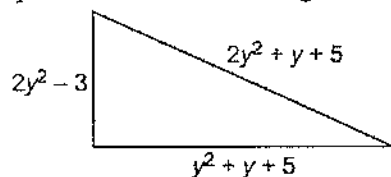
- Use algebra tiles to model the polynomial that fits each description. Sketch the tiles you used.
  - A binomial that contains the variables  $x$  and  $y$ , with constant term  $-2$ , and the coefficient of the other term is  $-3$
  - A trinomial that contains the variable  $k$ , the coefficient of the second degree term is  $-1$ , the coefficient of the first degree term is  $1$ , and the constant term is  $-8$

- For each polynomial, write an equivalent polynomial.

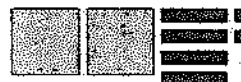
a)  $5a - b$

b)  $7q^2 - 2q - 1$

- Write an expression for the perimeter of this triangle. Simplify the polynomial. Determine the perimeter if  $y = 3$  cm.



- Create one addition and one subtraction question that gives this result.



- Add or subtract.

a)  $(3x + 6) - (x - 2)$

b)  $(3y + 7y^2 + 9) - (3y^2 + 4y)$

c)  $(x - 3x^2) + (7 + 3x - 3x^2)$

d)  $(-5y^2 - y + 9) - (-2y^2 - y - 4)$

- Write the multiplication sentence and the division sentence modelled by this set of algebra tiles.

- Multiply or divide.

a)  $-2(-5r - 3)$

b)  $(12p^2 - 18p + 24) \div (-6)$

c)  $(1 + 3f - 4f^2)(-6)$

d)  $(8y^2 - 6y + 2) \div (-2)$

- Here is a student's solution for this question:

$$3x(2x + 1)$$

$$= 6x + 3x$$

$$= 9x$$

Identify the errors in the solution, then give the correct solution.

- The perimeter of a rectangle is  $8s^2 + 12s$ . If the width of the rectangle is  $4s$ , what is the length? Explain your strategy.

## Unit 6: Linear Equations and Inequalities

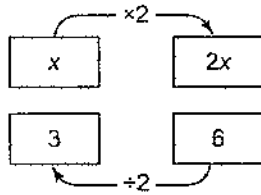
1. For each equation, select the solution from the given list of numbers.

-3, 3, 3.5, 2.5, 10.5, 12

a)  $4.5s + 1 = 14.5$       b)  $2(a + 6.5) = 20$   
 c)  $\frac{w}{7} - 4 = -2.5$       d)  $-(2r - 1) = 2(3 - 2r)$

2. Match each model with its equation.

a)



i)  $2x + 3 = x - 3$

b)

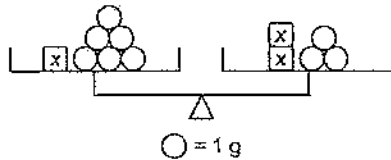


ii)  $2(x + 3) = 6$

c)

iii)  $2x = 6$

d)



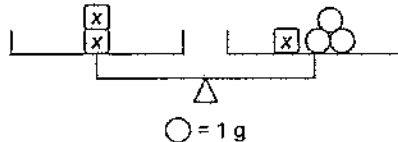
iv)  $2x = x + 3$

e)



v)  $x + 6 = 2x + 3$

f)



vi)  $2x + 6 = x + 3$

3. Solve each equation.

a)  $\frac{5.4}{b} = 1.2$

b)  $\frac{w}{3.5} + 1.4 = 5.6$

c)  $-2 = 1.6(k - 3)$

d)  $\frac{5n}{3} - 1 = \frac{3n}{2} + 4$

e)  $3.6(2a - 1) = 1.2(a + 3)$

f)  $\frac{1}{3}x + \frac{1}{2} = \frac{3}{4}x - \frac{1}{3}$

4. A cell phone company charges \$12.50 per month plus \$0.15 per minute of use.

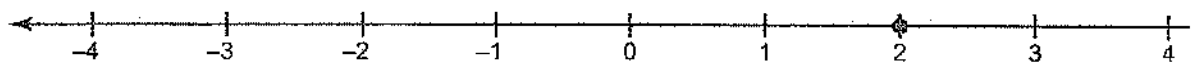
a) Write an equation to determine how long a person would have to talk to be charged a total of \$23.90.

b) Solve your equation.

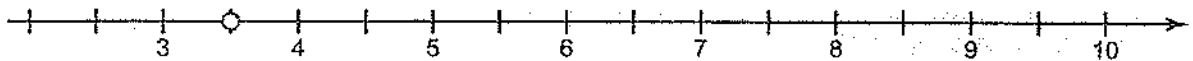
c) Verify your solution.

5. Write the inequality that is represented by each graph.

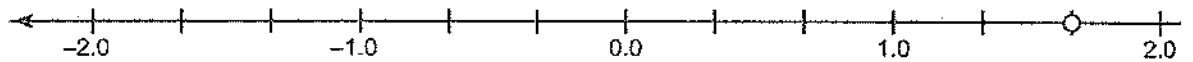
a)



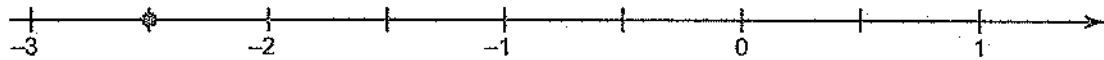
b)



c)

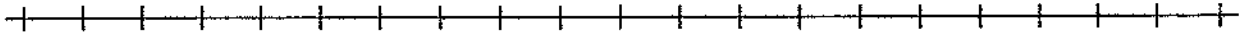


d)

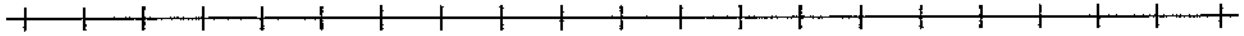


6. Solve each inequality and graph the solution.

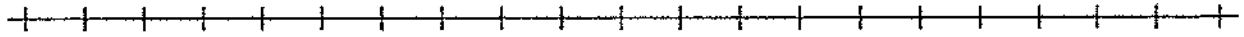
a)  $5 - y > 2$



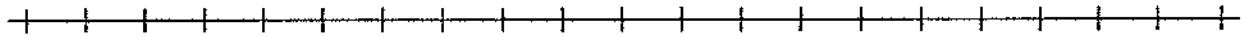
b)  $\frac{h}{2.4} \geq 5$



c)  $1.3x + 2.5 \leq 2.7x - 2.4$



d)  $-3(2 - d) \leq 6$



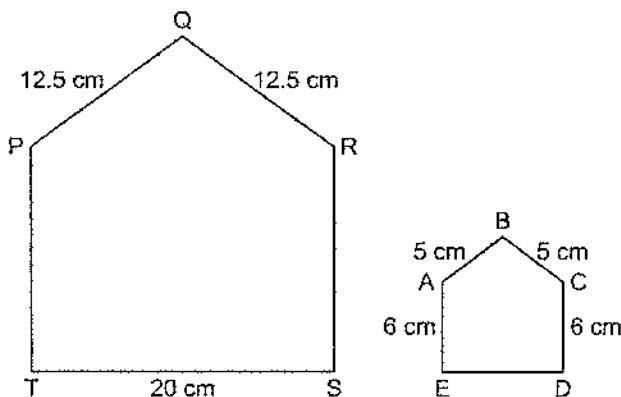
7. Christine wants to go to the fair. Admission costs \$4.50 and each ride costs another \$1.25. Christine wants to spend no more than \$25.00. How many rides can she go on?

- Select a variable and use an inequality to model this problem.
- Solve the inequality. Explain the solution in words.
- Verify the solution.



## Unit 7: Similarity and Transformations

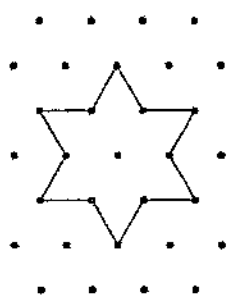
1. These two pentagons are similar.



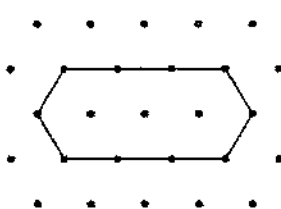
- Calculate the length of PT.
  - Calculate the length of DE.
  - Draw a reduction of pentagon PQRST with a scale factor of  $\frac{3}{5}$ .
  - Draw an enlargement of pentagon ABCDE with a scale factor of 2.
2. Naomi wants to calculate the height of a tree. She is 1.5 m tall and casts a shadow of 2.5 m. At the same time, the shadow of the tree is 10.5 m long.
- Sketch a diagram that can be used to calculate the height of the tree.
  - What is the height of the tree?
3. Plot these points on a grid: A(-2, 4), B(2, 4), C(2, 2), D(-2, 2)
- For each transformation below:
- Draw the transformation image.
  - Record the coordinates of its vertices.
  - Describe the symmetry of the diagram formed by the original shape and its image.
- rotation  $90^\circ$  clockwise about point E(0, 3)
  - reflection in the horizontal line passing through (0, 2)
  - a translation 4R, 2U

4. Describe the symmetry of each shape. Draw any lines of symmetry and state the order of rotation and the angle of rotation symmetry.

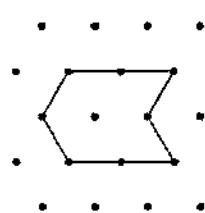
a)



b)

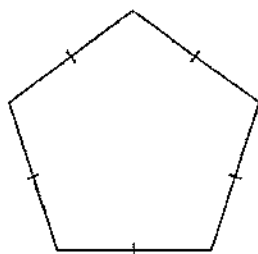


c)



d)

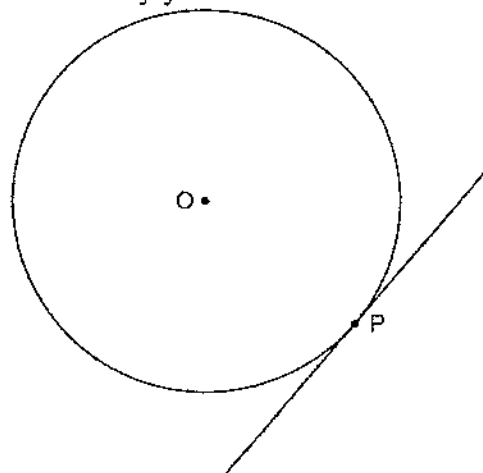
e)



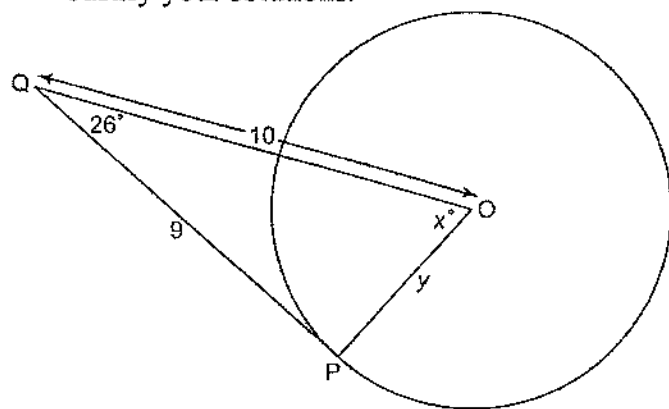
## Unit 8: Circle Geometry

Give your answers to the nearest tenth where necessary.

1. Point O is the centre of the circle.  
Is the line through P a tangent to the circle?  
Justify your answer.



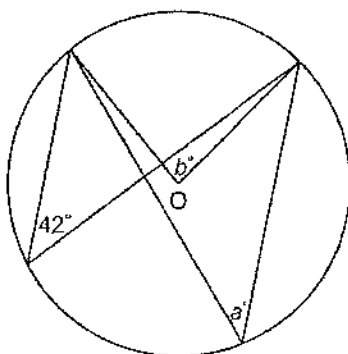
2. Point O is the centre of the circle.  
Point P is a point of tangency.  
Determine the values of  $x^\circ$  and  $y$ .  
Justify your solutions.



3. A circle with radius 10 cm has a chord with length 12 cm.  
How far from the centre of the circle is the chord?  
Draw a diagram to support your solution.

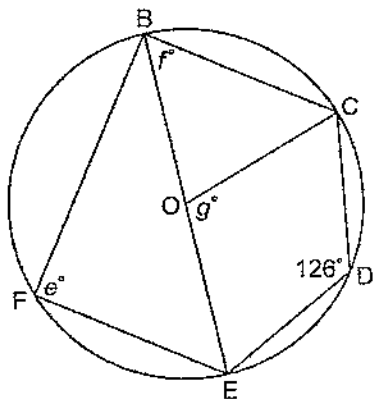
4. Draw and label a diagram to illustrate the relationship between the central angle and inscribed angle subtended by the same arc in a circle.  
How are inscribed angles subtended by the same arc related?

5. Point O is the centre of the circle.  
Determine the values of  $a^\circ$  and  $b^\circ$ .  
Justify your solutions.



6. The endpoints of the arms of an inscribed angle are the endpoints of a diameter.  
What is the measure of the inscribed angle? How do you know?  
Draw a diagram to support your answer.

7. Point O is the centre of the circle and BE is a diameter. Determine the values of  $e^\circ$ ,  $f^\circ$ , and  $g^\circ$ . Justify your solutions.



8. A communications satellite orbits Earth at an altitude of 250 km. Earth's radius is about 6400 km. How far from the satellite is the farthest place on Earth's surface that could receive the satellite's signal? Give the answer to the nearest kilometre.

## Unit 9: Probability and Statistics

1. A die with 6 faces is rolled 10 times. Each time, the die shows an even number.  
Klaus predicts the next roll will be odd.  
Joanna predicts the next roll will be even.  
Nicholas predicts the next roll is equally likely to be even or odd.  
How might each person have made his or her prediction?
2. Jenna thinks she is likely to score a goal in tonight's soccer game since she has scored a goal in 4 of her last 5 games.
  - a) What assumptions is Jenna making?
  - b) For each assumption, explain how the predicted outcome might be affected if the assumption changes.
3. Identify a potential problem with each data collection. Justify your answer.
  - a) Rachel asks: "What costume will you wear for Halloween this year?"
  - b) Jerome asks local dog kennels: "How often do you walk the dogs in your care?"
  - c) A dentist sends a questionnaire to her patients 6 months after their last check-up, asking them to rate the quality of care they received and reminding them to make an appointment for a new check-up.
4. Would you use a census or a sample to gather each set of data? Justify your choice.
  - a) To determine whether the strings of a guitar are in tune
  - b) To determine citizens' opinions about the new traffic laws
  - c) To test a new recipe for a cookbook
5. What sampling method is used in each situation? Will it give valid conclusions? Justify your answers.
  - a) A radio show invites city residents to call in their opinions about the city's crime rate.
  - b) To predict which movie will win a People's Choice Award, Carlos asks his friends which movies were their favourites.
  - c) For a week, every 10th customer leaving a restaurant is asked to rate the food and the service.
6. Ariadne mails a questionnaire asking, "Do you think there is a litter problem in our neighbourhood?" to every house on her street. What problems might Ariadne encounter as she collects data? Describe the effect each problem would have on her results.