

MAP 4CI : Review

Chapter 1 : Geometry: Optimization Problems

1. Minimizing Perimeter of a four sided rectangle

A farmer wants to fence a rectangular animal pen with the minimum amount of fencing, so that the pen has an area of 36m^2 .

- What is the minimum perimeter?
- What dimensions give the minimum amount of fencing?
- What shape of rectangle gives the minimum amount of fencing?
- Describe a method for calculating the minimum perimeter for a given area.

Use your method to calculate the minimum perimeter of a rectangular garden with an area of 220.25 m^2 ; 27 m^2 . Round your answers to the nearest 10^{th} if necessary.

2. Minimizing Perimeter of a three sided rectangle

An architect is adding a rectangular playground to the side of a school. The school will form one side of the rectangle. The area of the playground is to be 72m^2 .

- What is the minimum perimeter?
- What dimensions give the minimum amount of fencing?
- What shape of rectangle gives the minimum amount of fencing?
- What is the relationship between the two dimensions that give minimum perimeter?
- Write a formula for Area of a rectangle with minimum perimeter using only width.

Use your method to calculate the minimum perimeter for fencing 3 sides of a rectangular garden with an area of 50 m^2 ; 112.5 m^2 . Round your answers to the nearest 10^{th} if necessary.

3. Optimizing Surface Area of a Rectangular Based Prism

You want to minimize the cost of packaging for your product. Your design must hold a volume of 343cm^3 .

- What is the optimum shape of a rectangular based prism to minimize the surface area?
- What are the dimensions to give a volume of 343 cm^3 ?
- What is the relationship between the two dimensions that give maximum area?
- Write a formula for calculating the minimum surface area of a rectangular based prism with a maximum volume.

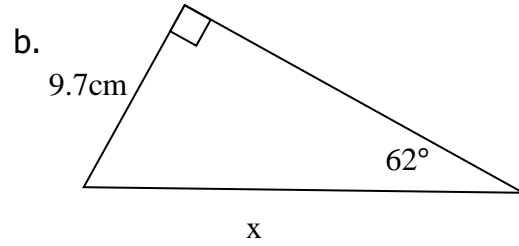
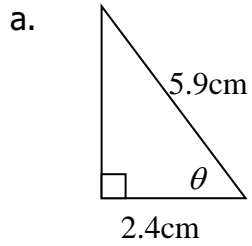
Use your method to calculate the minimum surface area of a rectangular based prism with volume of 729cm^3 and with a volume of 1500cm^3 .

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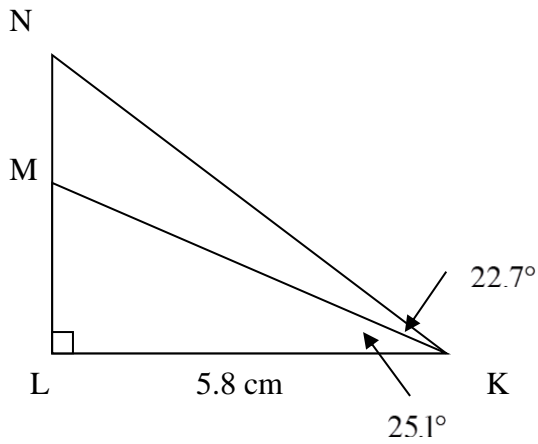
Chapter 2 - Trigonometry

Sample Problems

1) Find the unknown in each triangle.

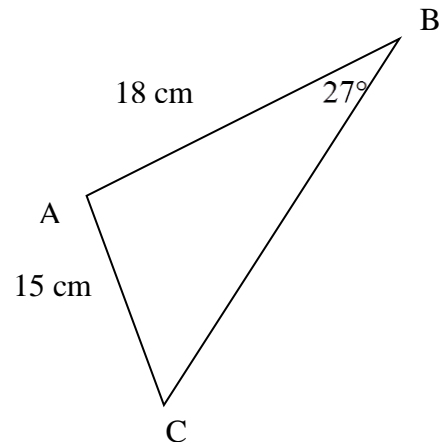


2) Find MN.

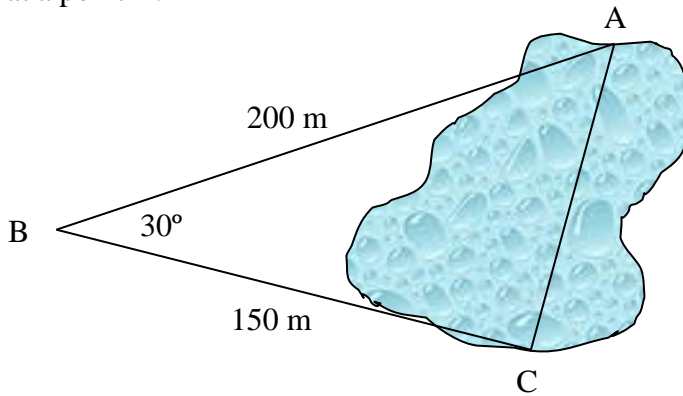


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3) Find side a in the following oblique triangle.



4) Find the width, to the nearest hundredth, of a small lake if the lengths 200 m and 150 m contain an angle of 30° at a point B.



Answers:

1. a. 66° , **b.** 11.0cm
3. 28.6 cm

2. 3.7 cm
4. 102.66m

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Chapter 3: Two-Variable Statistics and Chapter 4: Data Management

Key Concepts

Scatter Plots _____

Line of Best Fit _____

Interpolating / Extrapolating _____

Mean : _____

Median : _____

Mode : _____

Percentile : _____

Quartiles : _____

Survey / Sampling Definitions

Hypothesis - A possible answer to a question.

Primary Source - Use of a survey or an experiment to collect your own data.

Frequency - The number of times a measure occurs in a data set

Secondary Source - Information that has been gathered by someone else

Population - the entire group that is being studied.

Sample - small group chosen from a population and examined in order to make predictions about the population.

Random Sample - A specific number of people are selected randomly from the population. For example all the names are placed in a hat and 5 names are selected at random.

Systematic - Participants are chosen at pre-determined intervals. For example every 4th person on the school roster is chosen

Stratified - The population is divided into sub-groups, and samples are randomly chosen from each group. For example the school is divided into grades and an equal proportion is randomly selected from each grade.

Census - The entire population is surveyed.

Bias - when a sample is not representative of the population.

Margin of Error - describes how reliable the data is. For example a poll is said to be accurate within 3 percentage points 19 times out of 20.

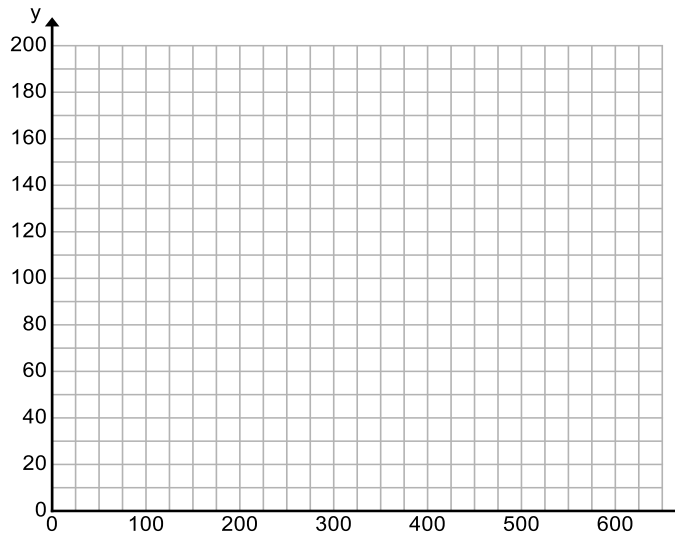
Percentile - tells approximately what percent of the data are less than a particular data value. Percentiles are a good way to rank data when you have a lot of data or you want to keep data private.

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Ch. 3: Two-Variable Statistics and Ch. 4: Data Management - Practice Problems

1) This table shows data for ten players from Toronto Blue Jays for the 2011 season.

# of times at Bat	# of hits
643	191
385	101
608	177
584	143
531	147
327	82
357	103
425	102
290	69
331	80



- Create a scatter plot of the data.
- Does there appear to be a correlation between the number of times at bat and the number of hits?
- Describe the correlation.
- Draw a line of best fit and use it to estimate the number of hits a player might have after 100 at bats and at 475 at bats.
- Which estimate is more accurate and why?

2) The following are average scores on a grade 9 English test.

76	74	78	75	69	58
68	72	85	78	72	49
68	87	90	73	70	83
70	75	75	76	65	74

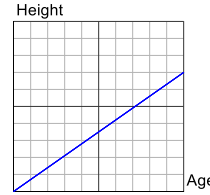
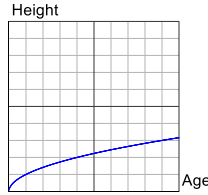
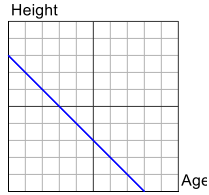
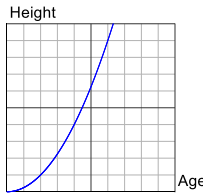
- Determine the mean, median and mode for this data set.
- What are the quartiles for this data set?
- Determine the 60th percentile score for this data set.

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Chapter 5 : Graphical Models

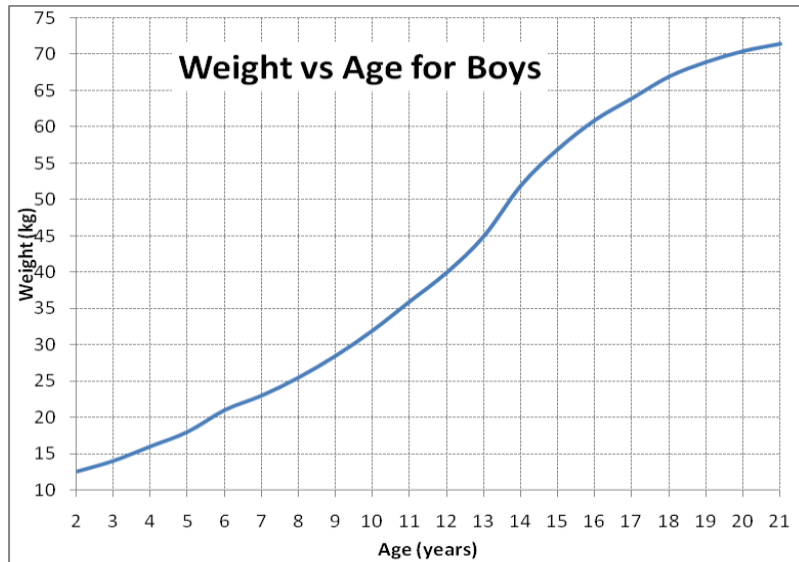
Interpreting Graphs to determine the relationship between the variables.

1. Which graph best represents the relationship between a person's age and height? Explain your reason for picking the graph.



Average Rates of Change

2. The graph below shows the trends for weight gains for boys. What is the average rate of change for boys from age 7 to age 13? What are the units on the rate of change value?



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Chapter 5 : Graphical Models

Picking a Graphical Model : Linear, Quadratic, Exponential

Determine if the following data sets exhibit show exponential growth, exponential decay, linear or quadratic relationships. Give reasons for your answer.

X	Y			
0	1000			
1	1100			
2	1210			
3	1331			
4	1464			

X	Y			
0	1000			
1	1100			
2	1200			
3	1300			
4	1400			

X	Y			
0	80			
1	40			
2	20			
3	10			
4	5			

MAP 4CI : Review

Chapter 6 : Algebraic Models

A. Simplifying / Evaluating Exponents

1. Simplify (remember – no negative exponents)

a. $\frac{y^{-1}}{y^{-2}}$

b. $x^{-1}(x^{-3})^{-2}x^{-7}$

c. $\frac{t}{v}\left(\frac{v}{t}\right)^{-3}v^4$

2. Convert to Radical Form $x^{\frac{4}{3}}$

3. Convert to Exponent Form $\sqrt[4]{\frac{1}{x^3}}$

4. Evaluate

a. $16^{\frac{1}{2}}$

b. $16^{\frac{1}{4}}$

c. $(-27)^{\frac{1}{3}}$

d. $\left(\frac{1}{9}\right)^{\frac{3}{2}}$

B. Exponential Equations

5. Solve for the unknown. Express with a common base, if possible. Otherwise use systematic trial.

a. $4^x = 8$

b. $81^{\frac{x}{2}} = 243^{x+1}$

c. $4^x = 40$

MAP 4CI : Review

Chapter 6: Algebraic Models - Practice Problems

A. Simplifying and Evaluating Exponents

1. Simplify, with no negative exponents:

a. $(m^5)(m^2)$ b. $t^4 \div t$ c. $(x^5)^3$ d. $\left(\frac{x}{y}\right)^{-3}$ e. $-(-x)^0$

2. Evaluate the following when $c=5$ and $d=-3$.

a. c^2d^3 b. $\frac{c^2d^3}{c^4d}$ c. $\frac{4c^{1/2}d}{c^{3/2}}$ d. $c^{-1}d^2 \times c^3 \div c^2$

3. Evaluate, round to nearest 1000th if necessary.

a. $64^{\frac{2}{3}}$ b. $\left(\frac{36}{121}\right)^{\frac{3}{2}}$ c. $2.1^{-1.6}$

4a. Write in radical form: i. $a^{\frac{1}{3}}$ ii. $a^{\frac{2}{3}}$ iii. $a^{\frac{1}{5}}$

4b. Write in exponential form: i. \sqrt{x} ii. $\sqrt[3]{x^2}$ iii. $\frac{1}{\sqrt[4]{a}}$

B. Exponential Equations

5. Solve the following equations algebraically (using common base). Check your answers.

a. $4^{2x} = 4^6$ b. $5^x = 625$ c. $3^{2x+1} = 9$

d. $10^{x+1} = 10^{2x-3}$ e. $4^{3x-2} = 32^{x+1}$ f. $25^{x+1} = 125^{x-2}$

6. Determine the value of y to the nearest tenth, using systematic trial.

a. $10^y = 125$ b. $3^y = 6$ c. $250(1.03)^y = 400$

C. Application Problems

7. The amount of medicine A (mg) remaining in a body after t hours can be calculated using the formula $A = 250(0.75)^t$.

a. Calculate the amount of medicine in mg remaining in a body after 5 hours.

b. How long to the nearest hour will it take until there is 10 mg remaining.

Answers:

1a. m^7 , b. t^3 , c. x^{15} , d. $\frac{y^3}{x^3}$, e. -1, 2a. -675, b. 0.36, c. -2.4, d. 9, 3a. 16, b. $\frac{216}{1331} = 0.1623$, c. 0.3051,

4a.. i. $\sqrt[3]{a}$, ii. $(\sqrt[3]{a})^2$ iii. $\frac{1}{\sqrt[5]{a}}$ 4b. i. $x^{1/2}$, ii. $x^{3/2}$ iii. $\frac{1}{x^{1/4}}$ 5a. 3, b. 4, c. 0.5, d. 4, e. 9, f. 8,

6a. 2.1, b. 1.6, c. 15.9 7a. 59.3 b. 11 hours.

MAP 4CI : Review

Chapter 7 : Financial Applications (Annuities and Budgeting)

Key Topics : Financial Models

Simple & Compound Interest

$$I = Prt$$

$$A = P(1 + i)^n$$

$$P = A(1 + i)^{-n}$$

Annuities : _____
Mortgages
Car Loans
Total Paid, Total Interest Paid

Budgets
Income vs Expenses

Practice Questions - Financial Models

- Determine i and n for each situation.
 - \$1000 earning 6% annual interest, compounded semi-annually for 5 years.
 - A \$4500 credit card balance at 28.8% annual interest, compounded daily for the month of July.
- Determine the Amount of each situation in question 1.
- Michelle invests \$5000 in her brother's restaurant earning interest at a rate of 2% per month, compounded monthly. At the end of 6 months she receives the following statement:

Time (month)	Amount (\$)
0	5000.00
1	5075.00
2	5151.13
3	5228.39
4	5306.82
5	5386.42
6	5467.22

- Does the amount of Michelle's investment grow exponentially as expected? Justify your reasoning.
- Is the rate of growth 2% per month compounded monthly? Explain.

- Michael and Abbey had a baby. They want to invest in the baby's post-secondary education. Assuming an average annual rate of return of 8% with interest compounded semi-annually, how much would they need to invest when the baby was born in order to have \$25 000 when the child turns 19?

Answers:

- a. $i=0.03$, $n=10$, b. $i=0.000789$, $n=31$
- a. 1343.92, b. 4611.38
- a. common ratio = 1.015; exponential growth b. no; the rate was agreed to be 2% per month but the interest earned is really only 1.5%
- 4)5632.14

Also – review Financial Applications Unit Test