CHAPTER TEST

1. Complete the following table showing the alternative ways of expressing a probability.

WAYS OF EXPRESSING PROBABILITY			
Fraction	*Decimal*	*Percentage*	*Words*
$\frac{3}{125}$			
	0.23		
			1 out of 16
		94%	

2. The playing pieces in a board game include a bag of 30 red chips, 20 blue chips, and 15 yellow chips.

   a) If Danica randomly chooses a chip from the bag, what is the probability that it will be yellow?

   b) What are the odds in favour of Danica choosing a yellow chip?

   c) Danica does draw a yellow chip, does not return it to the bag, then passes the bag to Ahmet. What are the odds in favour of Ahmet drawing a blue chip?

Board games have existed since ancient Egypt. Board games nowadays typically have a counter or game piece that moves along the playing board. A die or dice are rolled to move game pieces and provide an element of chance.

3. A toy factory produces model helicopters. In a quality control test of 675 helicopters, 8 were found to have broken propellers.

   a) What is the probability that a model helicopter will have a broken propeller?

   b) If the factory produces 100 000 model helicopters, how many can be expected to have broken propellers?

4. a) If a card is randomly chosen from a standard deck of playing cards, what is the theoretical probability that it will be an ace?

   b) Zach wanted to compare the theoretical probability to the results of an experiment. He shuffled the deck of cards, chose the top card, and recorded the result. He did this 50 times. In the 50 trials, he picked up an ace twice. Calculate the experimental probability of choosing an ace.

   c) How many times do you think an ace will be drawn in 2000 trials? Explain your answer.

5. A museum is holding a special promotion. The first 2000 patrons receive a coupon when they enter the museum. The odds in favour of winning a prize are 19:231.

   a) What is the probability of winning a prize if you are among the first 2000 patrons?

   b) How many prizes are there?

   c) If a class of 28 students visits the museum, how many students can be expected to win a prize?

Statistics

HOUSE PRICES IN WINNIPEG, MB	
range ($)	*Number of houses*
0–99 999	6
100 000–199 999	19
200 000–299 999	36
300 000–399 999	17
400 000–499 999	5
500 000–599 999	10
600 000–699 999	1
700 000–799 999	2
800 000–899 999	1
900 000–999 999	2
1 000 000+	3

3. The table shows a random sampling of 102 properties listed for sale in Winnipeg, MB.

   a) What is the percentile rank of a house listed in the $300 000–$399 999 range?

   b) What is the percentile rank of a property that sold for $1 000 000 or more?

   c) A house in the 81st percentile was sold. In what price range was the house?

CHAPTER TEST

1. Albert scored 66%, 89%, 73%, 73%, 89%, and 72% on assignments in his math class. The assignments are worth 40% of his final grade, and the final exam is worth 60%. If he earns a grade of 75% on his final exam, what will be his final mark in the course?

2. For a school production, Marcia bought the fabric for making costumes and backdrops. The different fabrics cost varying amounts per metre. Calculate the mean cost per metre of cloth.

COST OF FABRIC BOUGHT FOR SCHOOL PRODUCTION			
Cost per metre	$5.89	$12.49	$35.29
Number of metres purchased	38	12	3

One of the most expensive cloths in the world is made from the wool of the vicuña, a wild ancestor of the domesticated alpaca, found in South America. The wool is so rare because vicuña only produce 1 lb of wool a year. Vicuña yarns and fabrics can range from $1800.00 to $3000.00 a yard.

3. Dev is studying in the apprenticeship plumber/gasfitter program at Aurora College's Thebacha Campus in Fort Smith, NT. In his blueprint reading, sketching, and drawing course, he has earned the following marks:

- 70% on the first assignment
- 79% on the second assignment
- 68% on the first quiz
- 81% on the second quiz

To calculate his final grade, each assignment is worth 10%, each quiz is worth 15%, and the final exam is worth 50%. If he wants to earn 80% in the course, what mark does he have to earn on the final exam?

4. The students in Madison's class have the following heights:

167 cm, 200 cm, 155 cm, 135 cm, 142 cm, 143 cm, 137 cm, 155 cm, 143 cm, 164 cm, 161 cm, 139 cm, 152 cm, 143 cm

a) Calculate the mean, median, and mode. Which do you think best represents the average height in the class? Why?

b) Identify any outliers in the data and calculate the trimmed mean.

c) What is the percentile rank of the student who is 152 cm tall?

5. The table below shows the time it takes students to get to school.

TRAVEL TIMES TO SCHOOL						
Travel time (minutes)	<10	10–14	15–19	20–24	25–29	>30
Number of students	15	25	16	31	47	12

a) What is the percentile rank for time for a person who takes more than 30 minutes to travel to school?

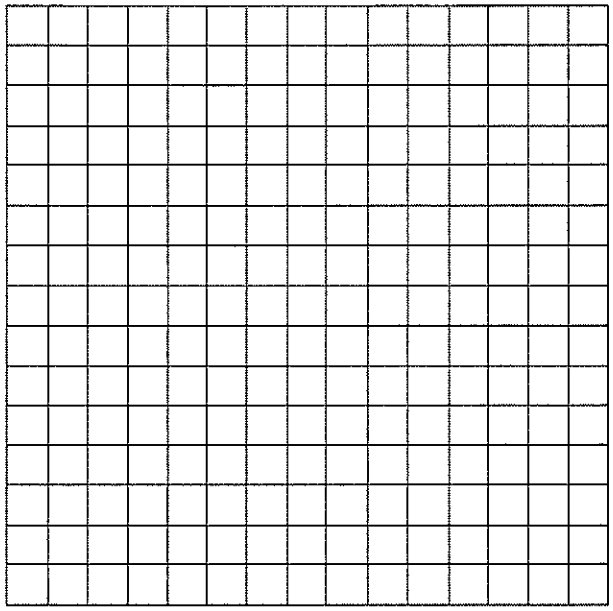
b) How long does it take a student in the 60th percentile to get to school?

Linear Relations

CHAPTER TEST

1. A balloon rises at a rate of 5 m/s.

   a) Create a table of values showing the height of the balloon above the ground for the first 5 seconds after its release and draw a graph of the data.



   b) Write an equation showing the relationship between the height of the balloon and the time elapsed.

   c) How long will it take the balloon to rise to a height of 300 m?

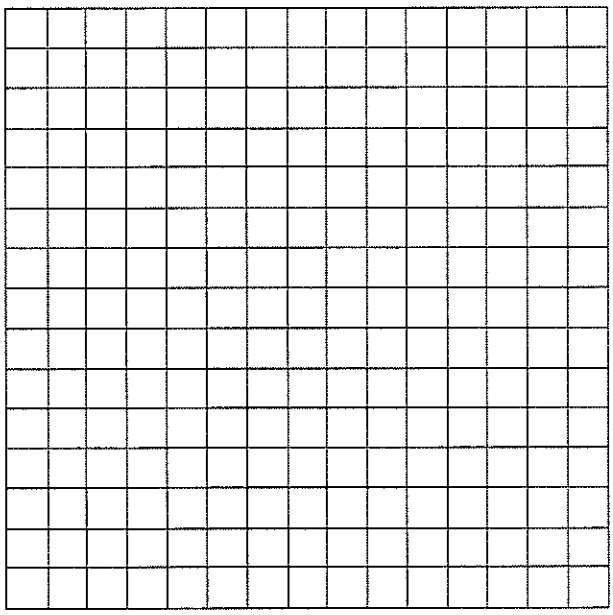
2. A bicycle rental company rents bikes at a rate of $7.50/h.

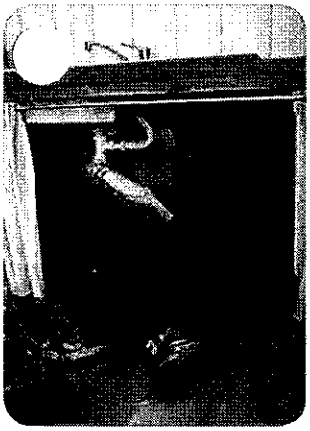
   a) Write an equation that represents the amount you would have to pay for renting a bike for any given number of hours.

   b) Use the equation to calculate how much it would cost you to rent the bike for 5 hours.

3. Jacqueline is a plumber. She charges a flat rate of $50.00 plus $30.00/h for emergency house calls.

   a) Create a table of values showing Jacqueline's earnings after each hour of work, up to 5 hours. Draw a graph of the data. Describe the relationship between the variables.





Plumbing emergencies can occur at any time of day. Plumbers sometimes have to be available to make repairs in the middle of the night.

b) What is the slope of the graph? What does it represent?

c) What is the y-intercept? What does it represent?

d) Write an equation that describes the relationship between hours of work and earnings.

4. Séan wants to join a gym. There are two gyms in his neighbourhood. Gym A charges a $100.00 fee to join, then charges $19.99 per month of membership. Gym B charges $29.99 per month of membership.

   a) Write equations representing the costs of the two gym memberships.

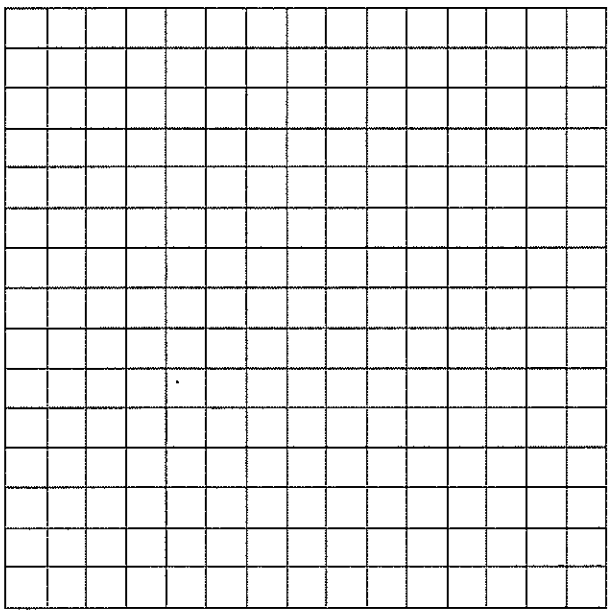
   b) If Séan plans to keep his membership for 12 months, which gym membership will be cheaper?

   c) How many months would Séan need to be a member for both gyms to cost the same amount?

5. Erika recorded the maximum outside temperature each day for 11 days, and the number of people who went swimming at the outdoor pool where she works.

MAXIMUM OUTSIDE TEMPERATURE VS. NUMBER OF SWIMMERS	
Maximum temperature (°C)	*Number of swimmers*
22	155
26	200
21	160
27	280
26	250
26	175
28	300
30	325
30	350
30	375
28	325

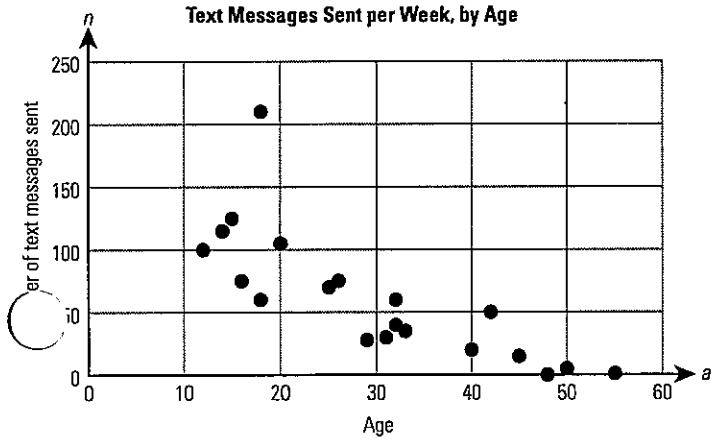
a) Draw a scatterplot of the data.



b) What is the relationship between temperature and number of swimmers?

c) If the relationship is linear, draw a line of best fit and write an equation for the line.

d) Using your equation, calculate how many people would be expected to swim if the temperature reached 35°C.



6. The scatterplot on the left shows the results of a survey of 20 people about the number of text messages they sent in a week, recorded by age.

a) Describe the relationship between the variables.

b) Draw a line of best fit and write an equation for the line.

c) Using your equation, how many text messages would you expect a 35-year-old to send per week?

d) How old would you estimate a person to be who sent 100 text messages in a week?

+ Vehicles

CHAPTER TEST

1. Explain what is meant by the following terms.

   a) start-up costs

   c) profit

   b) operating expenses

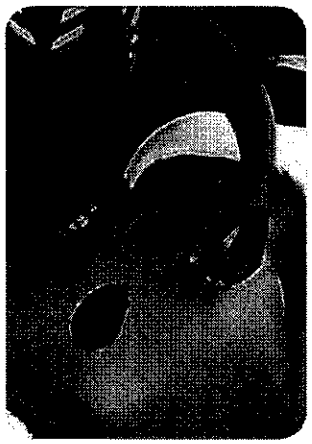
   d) break-even point

2. Classify the following items as start-up costs or operating expenses for a carpenter.

Item	*Start-up or Operating?*
Basic tools	
Ladder	
Rental storage space	
Truck payments	
Phone bill	
Gas	

3. Janelle is a massage therapist and would like to set up her own room in the existing health spa. She has estimated the following start-up costs.

Item	*Cost*
Rent	$680.00
Stools – 2	$70.00 each
Massage table	$416.00
Massage chair	$274.00
Blanket warmer	$89.00
Sound system	$415.00
Music – 5 albums	$15.00 each
Sheet sets – 8	$60.00 each
Pillows – 4	$20.00 each
Insurance	$123.00
Registration	$45.00
Oils and creams – 12	$15.00 each
Cleaning & supplies	$90.00



The stones used in hot stone therapy are immersed in water and heated using an electrical device to a certain temperature range. The heat of the stones relaxes muscles, improves circulation, and calms the nervous system.

a) What are her total start-up costs?

b) If Janelle has $3000.00 saved, does she have enough money to cover her start-up expenses? If not, suggest two ways she can adjust her spending to cover her start-up costs.

4. Kalie needs a $5000.00 loan to start her business. She has been offered the following loans by two different banks.

Option 1: interest rate of 3.50% per annum, compounded quarterly, for a 3-year term

Option 2: interest rate of 4.00% per annum, compounded annually, for a 3-year term

a) How much would Kalie need to repay with each option?

b) What would be the monthly payments for each option?

5. Brendan runs a furniture delivery service. His operating expenses are $4780.00 per month. If he charges $125.00 per delivery, how many deliveries must he make in a month to break even?

6. Sameera runs a landscaping business. Her revenue and expenses for one month are shown below.

The Sunken Garden, a feature of Butchart Gardens in Brentwood Bay, BC, was once an abandoned limestone quarry.

a) Classify each item as an expense or revenue.

Item	*Value*	*Revenue or Expense?*
Payment from customer	$500.00	
Soil	$56.00	
Payment from customer	$250.00	
Employee wages	$625.00	
Plants	$512.00	
Payment from customer	$700.00	
Gas for truck	$100.00	
Truck insurance	$130.00	
Truck repair	$300.00	
Employee wages	$512.00	
Payment from customer	$1000.00	
Telephone bill	$80.00	

b) Did Sameera's business have a profit or a loss for the month? Calculate the profit or loss.

7. Eldon has taken out a loan for $24 750.00 to buy a truck for his business. The term is 5 years and the interest rate is 3.40% per annum, compounded monthly.

   a) How much will Eldon have to pay back in total?

   b) How much interest will he pay?

   c) What will be his monthly payments?

8. Monique has leased a minivan for her home daycare. The conditions of the agreement are as follows:

   - term: 3 years
   - monthly payments: $675.00
   - security deposit: $500.00
   - delivery charge: $700.00
   - kilometre allowance: 24 000/year ($0.10/km for each additional kilometre)

   The residual value at the end of the lease term is $14 950.00.

   a) How much will it cost to lease the vehicle over a 3-year term? Assume Monique returns the vehicle in good condition, having driven 70 000 km.

   b) If Monique purchases the vehicle at the end of the lease term, how much will she have paid for it in total?

   c) If Monique buys the vehicle instead of leasing it, it will cost $29 900.00, including taxes and fees. What is the difference in price between purchasing the vehicle and leasing it, then purchasing it at the end of the lease term?

All child safety seats and booster cushions sold in Canada have an expiry or useful life date on them to ensure that owners have the most up-to-date and safest product available.

CHAPTER TEST

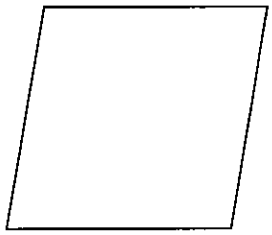
1. For each of the properties given in the table below, list which of the following polygons have the given property.

   Polygons: trapezoid, parallelogram, rhombus, isosceles trapezoid, rectangle, square, equilateral triangle, isosceles triangle, regular pentagon

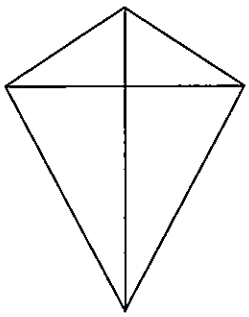
PROPERTIES OF POLYGONS				
At least two equal sides	*At least two congruent angles*	*At least one pair of parallel sides*	*Interior angles add up to 360°*	*A regular polygon*

2. Measure and label the side lengths and angles of the figure. Name the shape.

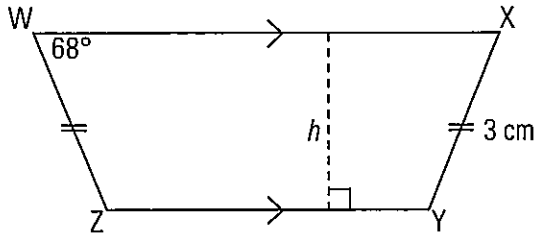
a)



b)



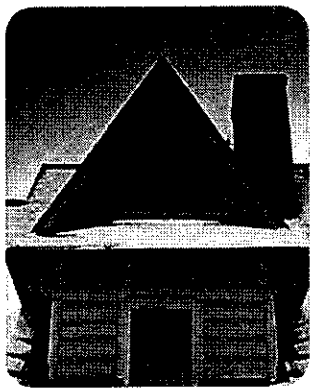
3. Using the diagram below, answer the following questions.



a) What is the measure of ∠Y?

b) What is the length of h?

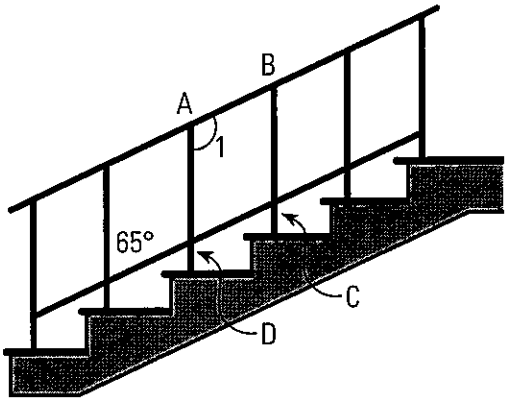
c) What type of quadrilateral is WXYZ?



A dormer is a structural feature that protrudes from a sloping roof. The term dormer comes from the Latin word for sleep—an cation of the popularity of dormer windows in bedrooms.

4. The dormer window on a house is in the shape of an isosceles triangle. The angle at the top is 76°. What are the measures of the angles at the base?

5. Examine the diagram of a stairwell railing below.

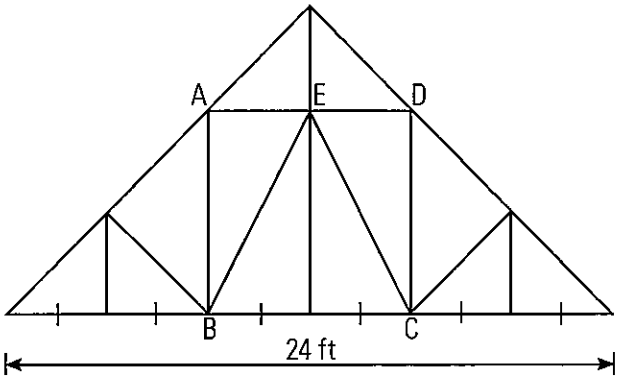


a) What is the measure of $\angle 1$?

b) What type of quadrilateral is ABCD?

6. Omar just bought a new hot tub for his back yard. It is in the shape of a regular hexagon. Each side of the hexagon is 2.5 feet long. What area in square feet will the hot tub cover?

7. A roof truss for a garage is designed as shown below. ABCD is a square.



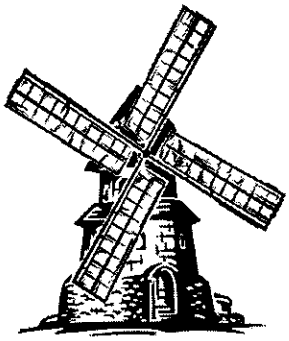
a) Calculate the length of BE.

b) Classify ΔABE by side length and angle measure.

c) Classify ΔBEC by side length and angle measure.

Transformations

CHAPTER TEST



Are the blades of this windmill perfect rotations about a centre point?

1. a) A point A(–5, 3) is translated 3 units right and 4 units down. What are its new coordinates?

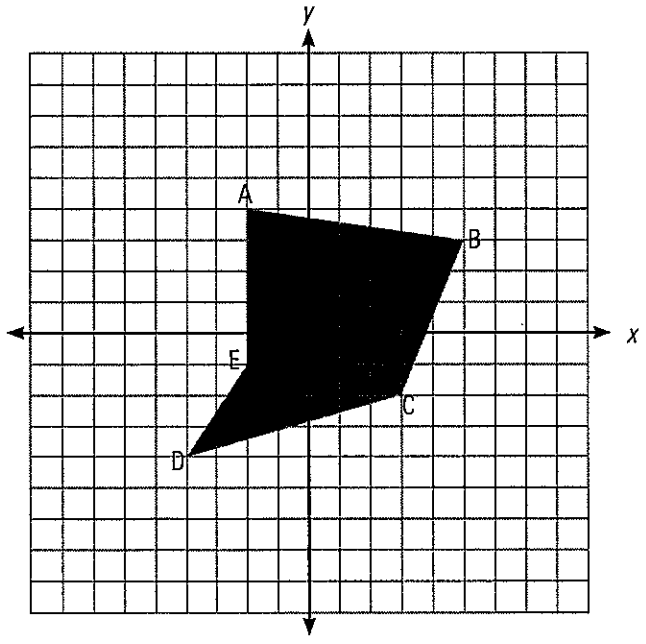
   b) A point C(–5, 3) is reflected across the *y*-axis. What are its new coordinates?

2. A point B(7, 4) is rotated 90° clockwise about the origin.

   a) In which quadrant is point B′?

   b) What are the coordinates of point B′?

3. Translate the following pentagon so that vertex A(–2, 4) moves to A′(1, 0).



   a) How far did each vertex move, and in which direction(s)?

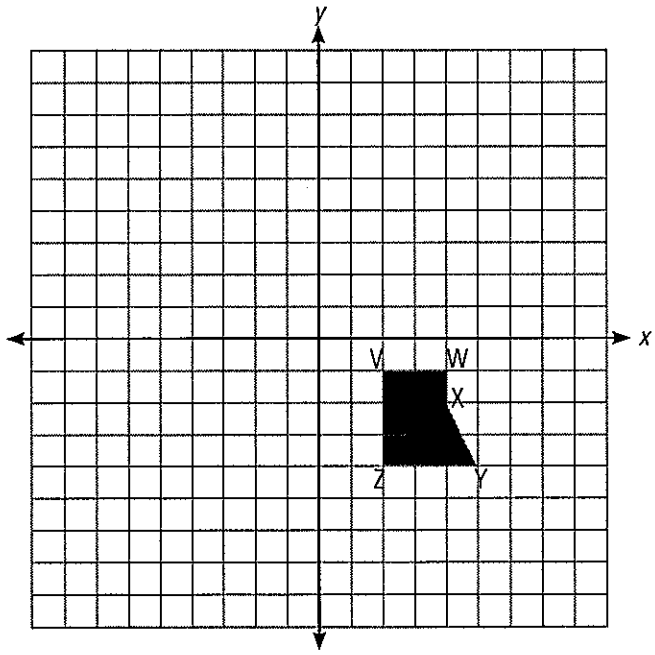
b) What are the coordinates of B′, C′, D′, and E′?

4. Rotate the following diagram:

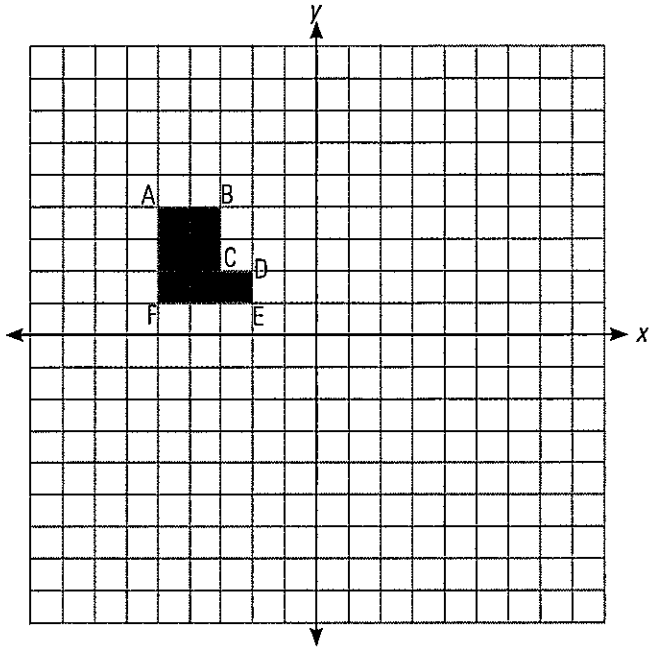
a) 90° clockwise about the origin. Label its vertices V′, W′, X′, Y′, and Z′, and state their coordinates.

b) 180° clockwise about the origin. Label its vertices V″, W″, X″, Y″, and Z″, and state their coordinates.

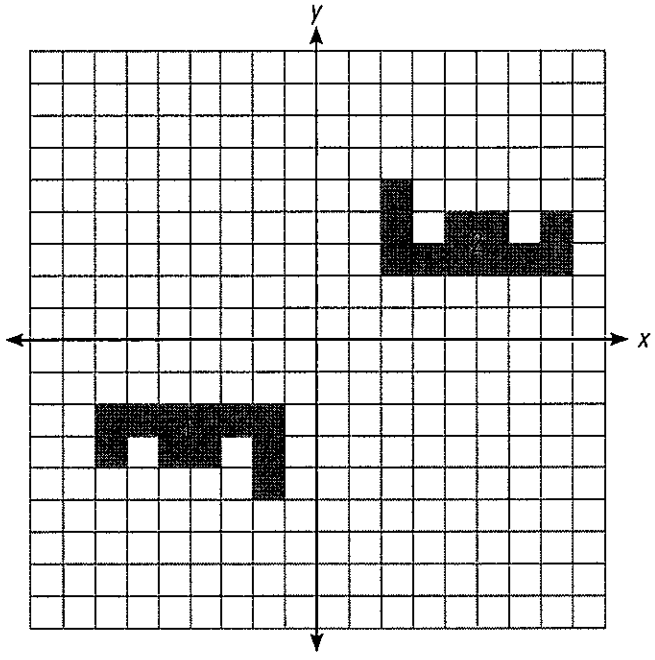
c) Reflect V″W″X″Y″Z″ over the *y*-axis. Label its vertices ABCDE, and state their coordinates.



5. Rotate the following shape 270° about the origin, then translate it 5 units to the right and 3 units up. What are the coordinates of the vertices of the resulting image?

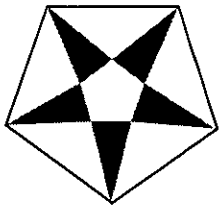


6. Shape 1 underwent transformations to become shape 2. What transformation(s) could have been applied to create the image?

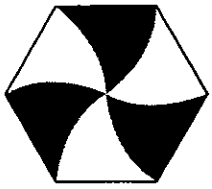


7. How many lines of symmetry does each image have? Draw in the line(s) of symmetry, if they exist.

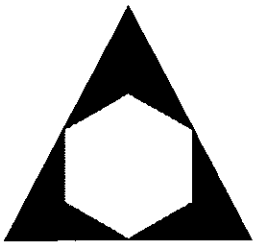
a)



b)

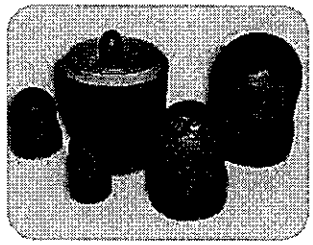


c)



d)

8. Katya creates handmade sets of nesting dolls, which she sells to craft and souvenir stores. One set includes five dolls. The mid-sized doll has a middle diameter of 7 cm and a height of 12 cm.



Nesting dolls were first designed and crafted in Russia, where they are called Matryoshka dolls. In the traditional design, the outermost doll shows a woman in traditional Russian peasant dress, the inner dolls depict either boys or girls, and the smallest doll is a baby. Matryoshka designs can now be found showing everything from movie stars, to politicians, to athletes.

a) The largest doll has a diameter of 12 cm. If it is a dilation of the mid-sized doll, what scale factor was used? What is the height of the largest doll?

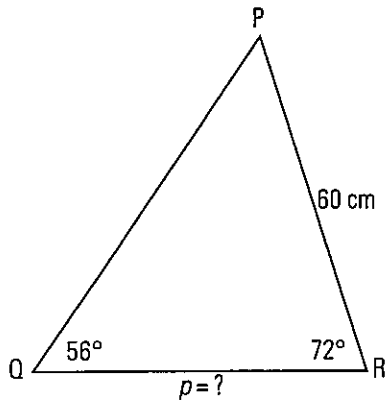
b) The smallest doll is a dilation of the mid-sized doll, by a scale factor of 0.3. What are the diameter and height of the smallest doll?

c) Katya made another set of dolls. In the new set, the largest doll has a diameter of 8.75 cm and a height of 15.6 cm. Is this a dilation of the first set of dolls?

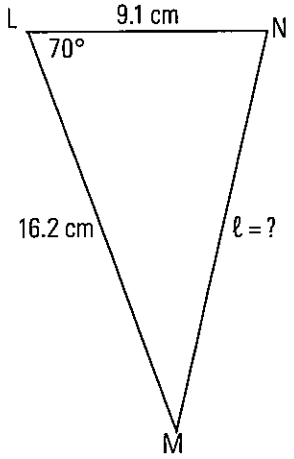
CHAPTER TEST

1. Calculate the length of the indicated side.

a)

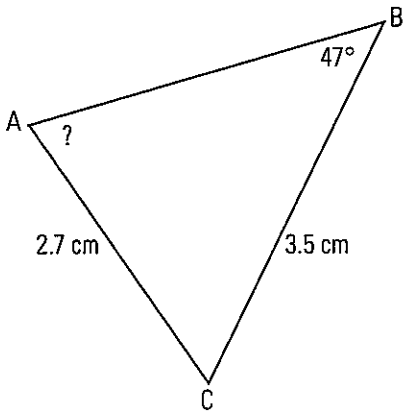


b)

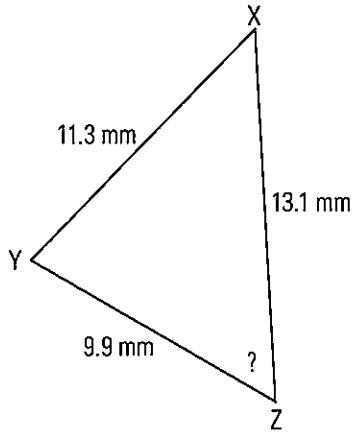


2. Calculate the size of the indicated angle.

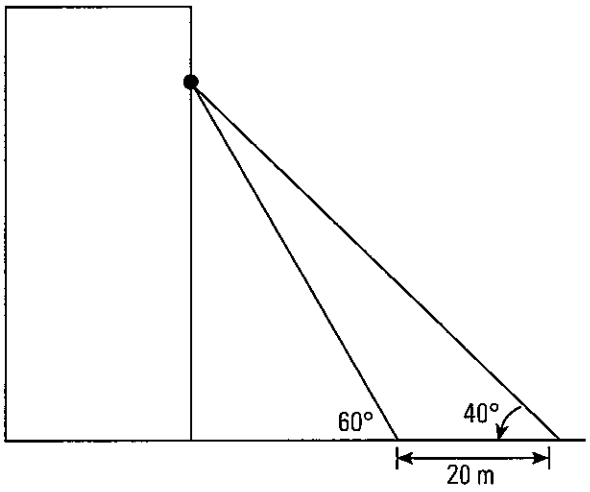
a)



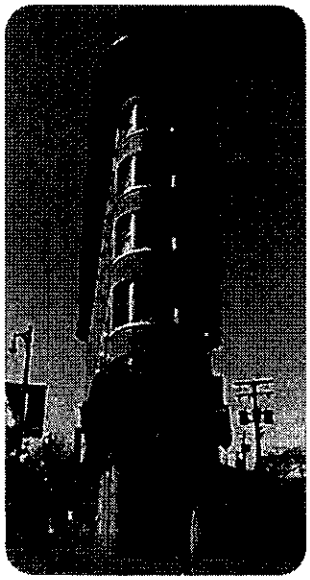
b)



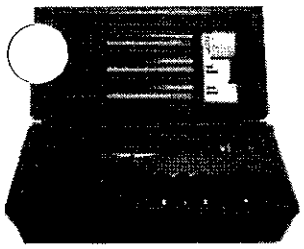
3. A contractor needs to repair a gargoyle on a building. At a distance away from the base of the building, he estimates that the angle of elevation to the gargoyle is 40°. He then moves 20 m closer to the base of the building and estimates the angle of elevation to be 60°. How high above the ground is the gargoyle?



4. Truong is building a treehouse for his children, and he wants it to be shaped as a triangular prism, like a flatiron building. He plans the walls to be 1.8 m, 2.2 m, and 2.4 m long. At what angles will the walls meet?

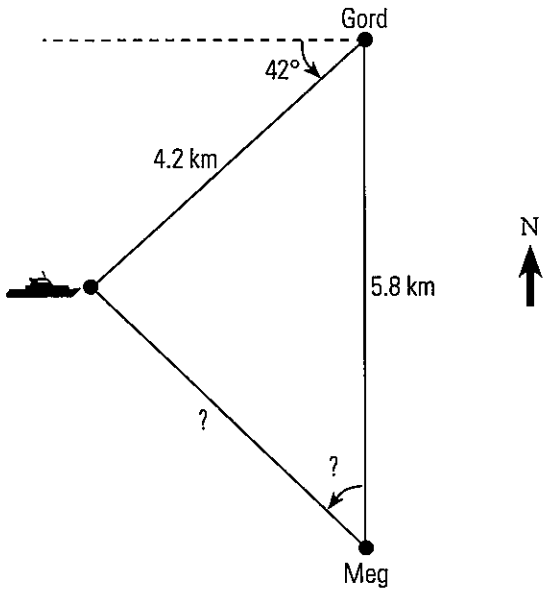


Flatiron buildings are in the shape of triangular prisms, and are so named because they look like the irons that were once used to iron clothes before electricity. This flatiron building is the Hotel Europe in Vancouver, BC. It was built in 1909, and is currently used as affordable housing.



A flare gun kit is essential in every boat. Flare guns must be shot directly above so that the signal is visible for a longer period of time and allows for a more accurate location of the person in distress.

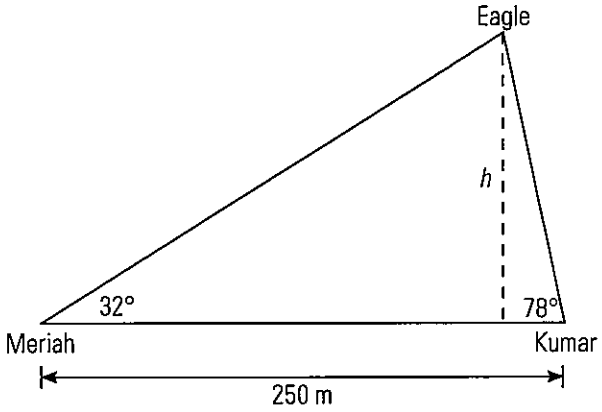
5. A boater sends an SOS call indicating that he is stranded on a point of land. Gord receives the call and determines that the boat is 3.2 km away from him at a direction of 42° south of west. Meg is at a station 5.8 km south of Gord.



a) How far is Meg from the stranded boater?

b) In what degree west of north would Meg have to travel to get to the stranded boater?

6. Meriah sees an eagle at an angle of elevation of 32° at the same time as Kumar spots it at an angle of elevation of 78°. They are on level ground, 250 m apart and on opposite sides of the eagle.



a) How far are Meriah and Kumar each from the bird?

b) At what height is the eagle flying?

The bald eagle is the national bird of the United States and a culturally significant animal to some Native Americans. In Canada, the majority of bald eagles breed in British Columbia.

CHAPTER TEST

1. Explain the difference between the following terms. Give an example to support your answer.

   a) accuracy and precision

   b) uncertainty and tolerance

2. Can a non-traditional unit be used to accurately measure the length of an object? Explain why or why not, using an example.

3. Which SI unit of length would be most appropriate for measuring each of the following items?

   a) the distance from Winnipeg, MB, to Regina, SK

   b) the thickness of a coin

   c) the length of a soccer field

   d) the length of a running shoe

4. What are the precision and uncertainty of the following measurements?

   a) 2.5 km

   b) 184 cm

   c) 405.33 kg

   d) 78.1°C

5. Logan is measuring the length of a part being manufactured in his machine shop. Its true measure is 26.025 956 mm. What measurement would Logan record, including the measurement uncertainty, using each of the following measuring devices?

   a) a ruler marked in centimetres

   b) a tape measure marked in millimetres

   c) a ruler marked in half-millimetres

   d) a micrometer, with the smallest gradation of 0.002 mm

6. Mali is following a recipe for a Thai red curry. The recipe calls for $3\frac{1}{2}$ cups of coconut milk. If Mali uses a measuring cup marked in quarter cups to measure the coconut milk, what are the maximum and minimum measures of coconut milk that she will add to the recipe?

7. Aksel is a shipping and receiving clerk at a warehouse. He is preparing packages for shipment to a customer. In one box, he packs items weighing 11.3 kg, 965 g, and 5.6 kg. What are the uncertainties of each of the items' weights? What is the combined weight and uncertainty of the box? (Ignore the weight of the box itself.)

8. Mary is cutting carpet to be installed in a hallway. The carpet is 5.65 m long. She cuts off a piece that is 29 cm long. What is the length, including uncertainty, of the remaining length of carpet?

9. A processing facility packages flour for sale in grocery stores. A 10-kg sack of flour must be within a tolerance of 0.5 kg to be acceptable for sale. What is the acceptable range of weights of a bag of flour?

10. The diameter of a drill hole for a dowel joint is specified as 1.524 cm ± 0.012 cm.

    a) What are the maximum and minimum accepted diameters of the drill hole?

    b) Which of the following drill holes meet the standard?

ACCEPTABLE MEASURED VALUES	
Drill hole diameter (cm)	*Acceptable? (Yes/No)*
1.5241	
1.5119	
1.532	
1.540	
1.5355	
1.537	

11. Ali is a glass lens cutter. He uses a micrometre to measure the glass. In order to fit a particular glass frame, a lens needs to have a thickness of 0.8 mm ± 0.005 mm.

    a) What is the tolerance?

    b) What are the maximum and minimum acceptable lens thicknesses?

The quality of a weld can be tested by checking for cracks, distortions, and bubbles, or by destructive testing to determine the weld's performance under certain conditions.

12. Kelsey is a welder. She needs to preheat a section of steel before welding, to reduce the risk of cracking as the steel cools. She needs to heat the steel to between 225°F and 275°F.

    a) What is the temperature tolerance?

    b) What is the nominal temperature?

    c) Write the acceptable temperature range in four different ways.