	SABIS® School Network	**Mathematics** **Level J** / Grade 8

End of Year Revision Packet

Highlights:

- Extend the definition of rational numbers to include negative numbers.
- Convert between mixed numbers and improper fractions.
- Express rational numbers as decimals and as fractions.
- Locate a rational number between 0 and 1 on a number line.
- Generate equivalent fractions.
- Add and subtract rational numbers / repeating decimals.
- Multiply and divide rational numbers.
- Calculate the product of two repeating decimals.
- Calculate the square of a rational number.
- Compute the quotient of two fractions or mixed numerals.
- Simplify complex fractions.
- Divide repeating decimals.
- Simplify numerical expressions involving rational numbers.
- Describe ratios in different forms.
- Write a ratio of three mixed numerals as a ratio of three whole numbers.
- Decide whether ratios form a proportion.
- Apply the cross product property.
- Express the parts in a ratio as percentages.
- Find the ratio of two or more parts given the percentage.

- Find the decimal expansion.
- Express a rational number as the ratio of two integers.
- Find the square root and cube root of a given number.
- Determine two consecutive integers between which the square root or the cube root of a number lies.
- Find an approximate value of a given irrational number and locate it between two numbers.
- Compare irrational numbers.
- Locate the approximate position of an irrational number on a number line.
- Solve the equation $x^2 = c$ and $x^3 = c$.
- Express the prime factorization of a number in exponent form.
- Simplify an expression with negative or zero exponents.
- Apply order of operations.
- Complete patterns involving exponents.
- Multiply and divide integer exponents.
- Write numbers in scientific notation.
- Compute the product, quotient, sum, and difference of numbers in scientific notation.
- Compare numbers in scientific notation.

- Express units of measurements using scientific notation.
- Extend the definition of exponents to a power of a power, powers of products, and powers of quotients.

- Locate points in all four quadrants of the coordinate plane.
- Recognize linear and nonlinear patterns.
- Use the slope formula for a straight line.
- Classify slopes of straight lines as positive, negative, zero, or undefined.
- Analyze proportional relationships.
- Compute the proportionality constant from a pair of values of the variables and write the corresponding equation.
- Use tabular representations of proportional relationships.
- Verify whether a set of points represents a proportional relationship.
- Draw a graph of a proportional relationship given as a rule or in context.
- Sketch and compare graphs of $y = mx$.
- Find the equation of a line passing through the origin, given one point on the line.
- Translate the proportionality constant/slope as a unit rate.
- Identify equivalent rates and interpret unit rates and the reciprocal.
- Compare proportional relationships from their graphs.
- Compare unit rates given in different representation: table of values, graphs, rule, or context, and interpret the results.
- Analyze a linear equation in two variables.
- Locate the intercepts of the graph of a linear equation.
- Analyze the slope-intercept form of a straight line.
- Determine whether a point belongs to a line from its equation.
- Write the equation of a line given a point and the slope or two points.
- Draw the graph of $y = mx + c$.
- Analyze the effect of m and c on the graph of $y = mx + c$.
- Graph a line whose equation is given in the general form.

- Test the balance of an equation for a given value of the unknown.
- Solve a linear equation with variable on one side.
- Recognize the possible solution sets of a linear equation.
- Recognize allowable solutions of a linear equation in a real-life situation.
- Solve a linear equation with variable on both sides.
- Simplify the coefficients of a linear equation.
- Solve a linear equation in more than one variable.

- Find the solution of systems of linear equations in two variables.
- Solve graphically a linear system of two equations.
- Solve systems of linear equations by substitution and elimination.
- Graphically estimate the solution of a linear system of two equations.
- Set up a linear system of two equations from a mathematical situation and from a real-life situation.
- Compare linear equations.

- Distinguish relations that are functions.
- Suggest a rule of a function from given input-output values.
- Discover a numerical rule for a function from given input-output values.
- Complete input-output tables.
- Classify the relation between any two of three or more variables as a function or not.
- Define a function graphically and algebraically.
- Identify linear functions.
- Examine a linear function by looking at its algebraic rule.
- Analyze and interpret the rate of change of a linear function.
- Identify a non-linear function.
- Compare and contrast two linear functions.

- Demonstrate knowledge of congruency among segments and angles.
- Demonstrate knowledge of congruency among polygons.
- Interpret the definition of a translation.
- Apply the angle sum theorem.
- Solve multi-step problems involving the angle sum theorem.
- Apply the exterior angle theorem.
- Discover pairs of corresponding angles formed by two parallel lines and a transversal.
- Describe the image of a point or a polygon in a coordinate plane under a translation.
- Interpret the definition of a rotation.
- Apply the relationship between vertically opposite angles.
- Discover pairs of interior angles formed by two parallel lines and a transversal.
- Describe the image of a point in a coordinate plane under a rotation.
- Interpret the definition of a reflection over a line.
- Know and apply the relation between the base angles of an isosceles triangle.
- Describe the image of a point in a coordinate plane under a reflection.

- Produce the image of a point under a dilation in the coordinate plane.
- Describe similar polygons and produce the image of a polygon under a dilation.
- Define a sequence of transformations that relate two similar polygons.
- Explain and apply the AA criterion for similar triangles.
- Recognize and apply the metric relations in a right triangle.
- Discover and solve applications of the Pythagorean Theorem.
- Explain a proof of the converse of the Pythagorean Theorem and identify Pythagorean triplets.
- Know and apply the distance formula in the coordinate plane.

- Know the volume of a sphere, hemisphere, cylinder, hemicylinder, cone, and truncated cone.
- Solve for missing parts.
- Compute volumes of composite solids.

- Differentiate between dependent and independent variables in a bivariate data set.
- Read / Construct a scatterplot to summarize and illustrate related data sets.

- Analyze the existence of a trend in a scatterplot and identify positive and negative trends.
- Identify outliers of a set of data points and understand their effect on the shape of the data distribution.
- Identify a linear association and discuss the properties of the relationship between two data sets represented in a scatterplot.
- Draw the line of best fit for a data set represented in a scatterplot.
- Approximate an equation of the line of best fit of a data set of points represented in a scatterplot.
- Compare the relation between two data sets to a linear model and interpret the components of the equation of the line in context.
- Use the linear model to forecast an approximation of the hidden values in a set of data points.
- Identify categorical data variables.
- Read and interpret associated categorical data sets represented in a two-way table.
- Calculate relative frequencies to compare categories and to make inferences about data sets.

Vocabulary:

- Rational numbers, Integers, Positive rational number, Negative rational number, Additive inverse, Proper fraction, Improper fraction, Mixed number, Decimal form, Terminating decimal, Repeating decimal, Repeating string, Graphical representation, Number line, Equivalence of fractions, Simplest form, Square of a fraction, Complex fractions, Numerical rational expressions, Ratios, Proportions, Cross product property, Percentages
- Irrational numbers, Decimal expansion, Square roots, Perfect square, Cube roots, Equation, Non-terminating non-repeating decimals, Non-terminating repeating decimals, Rational approximations of irrational numbers, Factors, Properties of exponents, Integer exponents, Exponent form, Prime factorization, Negative bases, Zero and negative exponents, Order of operations, Scientific notation, Standard form, Standard notation, Units of measurement, Prefix, Powers, Index
- Coordinate plane, Quadrants, Linear patterns, Nonlinear patterns, Similarity of triangles, Slope, Slope formula, Straight line, Positive and negative slopes, Proportional relationship, Proportional constant, Tabular representation, Graph, Unit rate, Horizontal line, Vertical line, Slope-intercept form, *y*-intercept, *x*-intercept, Rate of change, General form, Axes
- Linear equations, Variable, Algebraic sentence, Unknown, LHS, RHS, Balance method, Solutions, Solution set, Equivalent, Additive inverse, Multiplicative inverse, Rational coefficients, Fractional coefficients, Distributive property, Like terms, Unique solution, Infinitely many solutions, No solution, Rejected solutions, Common factors
- System of linear equations in two variables, Point of intersection, Solution of a system of linear equations, Graphical solution, Substitution method, Elimination method, Mathematical applications, Real-life applications, Comparing linear equations, Comparing plans
- Relations, Functions, Input, Output, Rule of a function, Ordered pairs, Input-output tables, Linear functions, Rate of change, Nonlinear functions
- Congruent line segments, Congruent angles, Congruency properties of line segments and angles, Congruent polygons, Translation, Angle sum theorem, Exterior angle theorem, Parallel lines and transversals, Rotation, Vertically opposite angles, Reflection, Base angles of an isosceles triangle
- Dilation, Similar, Reflexive property, Symmetric property, Transitive property, AA criterion, Pythagorean theorem, Converse of Pythagorean theorem, Pythagorean triplet, Distance formula
- Sphere, Hemisphere, Cylinder, Hemicylinder, Cone, Truncated cone
- Bivariate data, Independent variable, Dependent variable, Scatterplot, Association, Linear association, Nonlinear association, Positive association, Negative association, Outliers, Line of best fit, Linear model, Categorical variables, Relative frequencies

Level J Revision Exercises:

Ch. 1 **Rational Numbers**
Section 1 **Representation of Rational Numbers**

1. Carlos had $3. He bought a pack of gum that cost three quarters. How much money did Carlos have left? Express the answer as a mixed numeral and as an improper fraction.

2. Choose the larger number from each of the given pairs. If the two numbers are equal, state so.

a) $\frac{11}{8}$ and $1\frac{5}{8}$ b) $\frac{25}{12}$ and $2\frac{1}{12}$ c) $\frac{15}{7}$ and $2\frac{1}{7}$

d) $\frac{13}{5}$ and $2\frac{2}{5}$ e) $3\frac{3}{16}$ and $\frac{51}{16}$ f) $\frac{11}{8}$ and $1\frac{5}{8}$

3. Express each rational number in decimal form.

a) $\frac{1}{32}$ b) $\frac{11}{7}$ c) $7\frac{1}{25}$

4. Express each decimal as a fraction in its lowest terms.

a) 0.125 b) $0.\overline{2}$ c) $0.2\overline{35}$

5. Locate each of $0.\overline{3},\ \frac{4}{9},\ \frac{2}{7}$, and 30% on a number line. List the numbers in descending order.

Section 2 **Addition and Subtraction of Rational Numbers**

1. Whenever applicable, express each sum or difference as a mixed numeral in simplest form.

a) $\frac{3}{7}+\frac{5}{56}$ b) $\frac{3}{5}+\frac{2}{10}+\frac{9}{20}$ c) $\frac{1}{4}+\frac{3}{5}+2$

d) $\frac{3}{4}+1\frac{4}{5}$ e) $2\frac{1}{3}+3\frac{1}{4}$ f) $\frac{3}{7}-\frac{1}{3}$

g) $3\frac{3}{4}-3\frac{1}{2}$ h) $2\frac{1}{3}+3\frac{1}{4}$ i) $2\frac{2}{3}-5\frac{5}{6}+2$

2. Add or subtract. Express the answer in fractional form or as a mixed number.

a) $0.\overline{3}+\frac{1}{2}$ b) $1.\overline{6}-\frac{1}{3}$ c) $2.\overline{3}-3.\overline{2}$

3. Ted had $3\frac{1}{4}$ gallons of fuel in the tank of his van. Before driving the van to the lake, he purchased $5\frac{1}{5}$ gallons of fuel. The trip to the lake and back usually consumes $4\frac{1}{2}$ gallons. How much fuel will be left in the tank after the trip?

Section 3 **Multiplication and Division of Rational Numbers**

1. Marsha bought a plant that was $3\frac{11}{12}$ ft tall. A few weeks later, it grew and reached one and a half times its original height. Express the new height of the plant as a simplified mixed numeral.

2. A market surveyed its customers and concluded that $\frac{2}{3}$ of the weekend shoppers buy meat. Of those who buy meat, $\frac{3}{4}$ buy ribs. What portion of the weekend shoppers buy ribs?

3. Express the quotient as a fraction or a mixed numeral in its lowest terms.

a) $\frac{6}{11} \div 3$ b) $\frac{1}{8} \div \frac{1}{12}$ c) $1\frac{3}{5} \div \frac{4}{25}$

4. A farmer owns $10\frac{2}{3}$ acres of land. He wants to divide the land into four lots of equal area. What is the area of each lot?

Section 4 **Simplifying Numerical Rational Expressions**

1. Express as a fraction or as a mixed numeral in lowest terms.

a) $\frac{3}{5} + \frac{6}{15} \times \frac{2}{3}$ b) $\frac{1}{4} \times \frac{2}{3} - \frac{2}{3} \div \frac{3}{5}$ c) $2\frac{1}{2} \times \left(-1\frac{3}{5}\right) + 2\frac{3}{8}$

d) $\frac{1}{4} - \left(1 - \frac{1}{4}\right)^2 + \frac{2}{5}$ e) $\dfrac{1 - \frac{1}{25}}{1 - \frac{1}{5}}$ f) $\frac{3}{5} \times \left(\frac{2}{3} - \frac{5}{6}\right)$

2. A number is $1\frac{3}{4}$ less than twice the sum of the two numbers $2\frac{1}{2}$ and $5\frac{1}{6}$.

a) Express the unknown number in terms of the two given numbers.

b) What is this number?

Section 5 **Ratios and Proportions**

1. A round pizza contains 8 slices. Two of the slices have pepperoni topping. The rest are topped with vegetables.

a) What fraction of the pizza have pepperoni topping?

b) What is the ratio of the number of pepperoni slices to the number of vegetable slices?

2. Last month, Craig spent $\frac{5}{7}$ of his income and saved the rest. What is the ratio of the money Craig saved to the money he spent?

3. Solve for *x*.

a) $\frac{x}{16} = \frac{3}{4}$ b) $\frac{5}{x} = \frac{10}{3}$ c) $\frac{7}{3} = \frac{x}{6}$

d) $\frac{9}{x} = 1\frac{1}{2}$ e) $\frac{\frac{1}{2}}{x} = 1\frac{1}{2}$ f) $\frac{1\frac{1}{4}}{1\frac{3}{5}} = \frac{5}{x}$

4. Carla paid \$6.75 for 3 pounds of grapes.

a) What is the cost of 2 pounds of the same grapes?

b) How many pounds of the same grapes can Carla buy for \$11.70?

Chapter Summary TB read pages 34 – 35
Chapter Test TB pages 36 – 38

Ch. 2 **Number Sense**

Section 1 **Rational and Irrational Numbers**

1. Using $\frac{1}{3} = 0.\overline{3}$, find the decimal expansion of each of the following fractions.

a) $\frac{2}{3}$ b) $\frac{7}{3}$ c) $9\frac{1}{3}$ d) $\frac{5}{3}$

2. Use $0.1\overline{6} = \frac{1}{6}$ to express each of the following decimals as a fraction.

a) $0.0\overline{6}$ b) $0.\overline{6}$ c) $1.3\overline{6}$ d) $2.51\overline{6}$

3. Arrange each list of numbers in ascending order.

a) $\sqrt{42}$, 6, 7, $\sqrt{41}$ b) 5, $\sqrt{26}$, 5.5, $\sqrt{27}$ c) $\sqrt{80}$, $\sqrt{85}$, 9, 10

4. The radius *r* of a hemisphere of volume *V* is given by the equation. $r = \sqrt[3]{\frac{3V}{2\pi}}$

a) What is the radius of a hemisphere that has a volume of 54π in^3?

b) What is the radius of a hemisphere that has a volume of $60\frac{3}{4}\pi$ in^3?

c) What is the radius of a hemisphere that has a volume of 48π in^3?

Section 2 **Working With Irrational Numbers**

1. In a rectangle with side lengths *a* and *b*, the length of the diagonal *c* is given by the equation $c = \sqrt{a^2 + b^2}$. Below are the side lengths of several rectangles. Which of these rectangles have diagonals whose lengths are rational numbers?

a) $a = 5$ and $b = 12$ b) $a = \frac{1}{3}$ and $b = \frac{1}{4}$ c) $a = \sqrt{10}$ and $b = \sqrt{5}$

2. Solve for *x*.

a) $x^3 = -27$ b) $x^3 = \frac{27}{1{,}000}$ c) $x^3 = 0.343$

Section 3 **Integer Exponents**

1. Simplify each expression leaving each answer as a fraction.

a) $\frac{(-4)^{-3}}{(-5)^{-2}}$ b) $(-7)^{-2}$ c) $\frac{2^3 \times 7}{3 \times 5^3}$ d) $\frac{3^2 \times 7^0}{5^3}$

2. When tossed, a biased coin shows heads with a probability of $\frac{1}{3}$. The following table shows the probability P of getting n heads when this coin is tossed n times.

n	1	2	3	4	5
P	$\frac{1}{3}$	$\frac{1}{3} \times \frac{1}{3} = \left(\frac{1}{3}\right)^2$			

a) If you know the probability of getting n heads when a coin is tossed n times, how do you find the probability of getting $n + 1$ heads when the coin is tossed $n + 1$ times?

b) Complete the probability table when $n = 3$, 4, and 5.

c) Sandra suggests the equation $P = \frac{n}{3}$ to calculate the probability of getting all heads when a coin is tossed n times. David suggests the equation $P = 3^{-n}$. Which of the two equations produces the same probabilities listed in the table?

d) Show that it is proper to write $3^{-n} = \left(\frac{1}{3}\right)^{-n} = \frac{1}{3^n}$.

Section 4 **Multiplication and Division With Integer Exponents**

In 1 – 6, simplify and express the answer in terms of positive exponents only. Do not evaluate.

1. $(2^3 \times 11^4)(2^6 \times 11^3)$ **2.** $(3^5 \times 5)(3^{-3} \times 5^2)$ **3.** $(7^4 \times 5^3)(7^{-5} \times 5^2)$

4. $(2^4 \times 5^3)(2^{-4} \times 5^{-5})$ **5.** $(5^{-5} \times 7^3)(5^2 \times 7^{-5})$ **6.** $(11^{-4} \times 10^3)(11^5 \times 10^{-3})$

7. Find x.

a) $11^7 = 11^5 \times 11^x$ b) $3^7 = 3 \times 3^x$ c) $10^8 = 10^4 \times 10^x$

In 8 – 13, simplify and express the answer in terms of positive exponents only. Do not evaluate.

8. $\dfrac{2^5 \times 7^8}{7^3}$ **9.** $\dfrac{3^5 \times 5^2}{5^7}$ **10.** $\dfrac{3^5 \times 11^4}{3^5}$

11. $\dfrac{3^2 \times 10}{3^9 \times 10^{-1}}$ **12.** $\dfrac{2^7 \times 3^{-2}}{2^2 \times 3^8}$ **13.** $\dfrac{5^8 \times 7^{-2}}{5^3 \times 7^{-5}}$

14. A scientist is studying the decay of two samples of different radioactive isotopes that initially had the same mass of 25 g. After a certain time, the mass of the first sample decreased to 25×2^{-6} g and the mass of the second sample decreased to 25×2^{-4} g. Find the ratio of the two samples after the decay.

Section 5 **Scientific Notation**

1. Write the described quantity in scientific notation.

a) In the first quarter of 2014, the population of the world exceeded 7,149 million persons.

b) On average, a strand of human hair is 0.0071in. in diameter.

c) There are about 204,000 crab eater seals living in the Ross Sea.

2. Which number in each pair is larger?

a) 2.23×10^5 or 5.36×10^4 b) 1.36×10^{-2} or 5.75×10^{-3}

c) 2.05×10^4 or 2.15×10^4 d) 3.752×10^{-4} or 3.749×10^{-4}

e) 50,000 or 5×10^3 f) 0.001 or 3×10^{-2}

3. An ant is about 10^{-1} cm long. Use scientific notation to express the length of an ant in meters. (1 m = 100 cm)

Section 6 **Operations in Scientific Notation**

1. Use scientific notation to find the product.

a) $0.00004 \times (7 \times 10^{-2})$ b) $80{,}000 \times (6 \times 10^{-3})$

c) $5000 \times (3 \times 10^2)$ d) $.00025 \times (4 \times 10^6)$

In 2 – 7, use scientific notation to find the quotient.

2. $\dfrac{2 \times 10^4}{400}$ **3.** $\dfrac{9.3 \times 10^{-2}}{3000}$ **4.** $\dfrac{1.75 \times 10^3}{50{,}000}$

5. $\dfrac{25{,}000}{5 \times 10^3}$ **6.** $\dfrac{3{,}000}{1.5 \times 10^{-2}}$ **7.** $\dfrac{320{,}000}{1.6 \times 10^7}$

In 8 – 11, simplify and express the answer in scientific notation.

8. $3.2 \times 10^{3} + 5.3 \times 10^{3}$ **9.** $4.8 \times 10^{4} + 8.7 \times 10^{4}$

10. $8.9 \times 10^{-3} - 2.6 \times 10^{-3}$ **11.** $1.7 \times 10^{-5} - 1.2 \times 10^{-5}$

12. How many times larger is 1.5×10^{6} than 3×10^{4}?

13. Simplify, and express your answer in scientific notation.

a) $\dfrac{3.4 \times 10^{-10} \times 5.01 \times 10^{-4}}{3.0 \times 10^{-10}}$ b) $\dfrac{7.0 \times 10^{-4} + 0.3 \times 10^{-3}}{10 \times 10^{-2}}$

Section 7 **Powers of Numbers With Integer Exponents**

In 1 – 6, solve for *x*.

1. $\left(2^{x}\right)^{3} = 2^{27}$ **2.** $\left(\dfrac{1}{3^{x}}\right)^{2} = 3^{8}$ **3.** $\left(\dfrac{1}{2^{-x}}\right)^{5} = 2^{15}$

4. $\left(3^{4}\right)^{5} = 9^{2x}$ **5.** $16^{-x} = \left(2^{2}\right)^{2}$ **6.** $125^{x} = \left(\dfrac{1}{25}\right)^{3}$

In 7 – 9, simplify.

7. $\dfrac{\left(22^{3}\right)\left(22^{5}\right)}{\left(22^{3}\right)^{3}}$ **8.** $\dfrac{\left(3^{2}\right)\left(3^{-2}\right)^{5}}{\left(3^{5}\right)^{-2}\left(3^{4}\right)}$ **9.** $\dfrac{\left(8^{4}\right)^{0}\left(8^{2}\right)^{4}}{\left(8^{3}\right)\left(8^{4}\right)^{5}}$

Chapter Summary TB read pages 79 – 80
Chapter Test TB pages 81 – 83

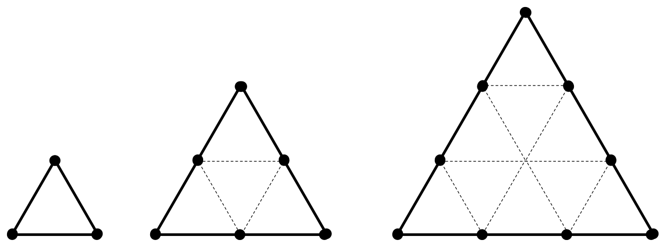
Ch. 3 **Linear Relationships**

Section 1 **Linear Patterns**

In 1 – 2, three vertices of a rectangle are given. Plot the points in a coordinate plane and determine the coordinates of the fourth vertex.

1. (4, 1), (4, –2), (–1, 1) **2.** (–1, 2), (– 4, 2), (– 4, 6)

3. The pattern of triangles consists of equilateral triangles. The side length of the first one is 1 unit, the side length of the second one is 2 units, and the side length of the third one is 3 units.



Each triangle can be dissected into equilateral triangles with side length equal to 1. Let *p* be the perimeter of the triangle and *n* be the number of equilateral triangles with side length 1 that are needed to cover the triangle. The following table lists the corresponding values of *p* and *n*.

	First	Second	Third	Fourth	Fifth
Perimeter (*p*)	3	6	9		
Number of triangles (*n*)	1	4	9		

a) Complete the table.

b) Plot the ordered pairs (*p*, *n*) listed in the table in the coordinate plane.

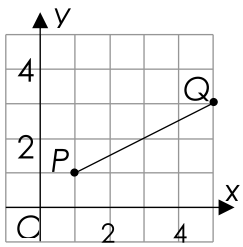
c) Do the points lie on a straight line? Is the relationship between *n* and *p* linear?

d) Use trial and error or any other technique to find the equation that describes the relationship between *n* and *p*.

Section 2 **The Slope of a Straight Line**

1. In each of the following graphs, find the rise and run from P to Q. Calculate the slope of the line segment joining the two points.

a)



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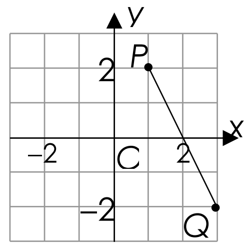
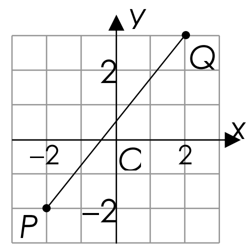
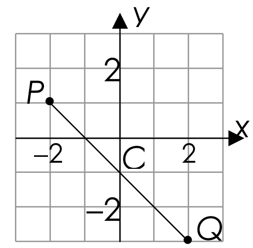


c)



d)



In 2 – 5, find the value of a knowing that the three points are collinear.

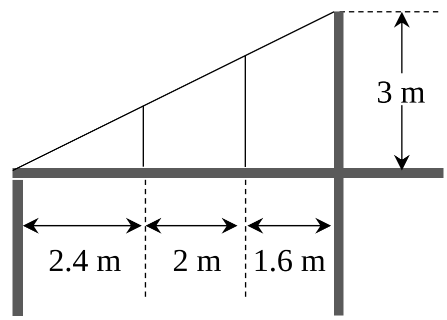
2. (1, 3), (2, –1) and (3, a)

3. (2, 3), (–4, 3) and (–2, a)

4. (–5, 2), (2, –5) and (0, a)

5. (4, –3), (2, –5) and (a, 0)

6. The adjacent diagram shows a section of a suspended bridge. Calculate the lengths of the two vertical cables that hold the span of the bridge.



Section 3 **Proportional Relationships**

1. Given y is proportional to x and $y = 30$ when $x = 2$:

a) Write an equation that describes the relationship between x and y.

b) Find y when $x = 3.5$.

c) Find x when $y = 27$.

2. A car assembly line of 10 workers produces 15 cars per week. The number of cars assembled per week, y, is proportional to the number of workers, x.

a) Write an equation that describes the relation between x and y.

b) How many cars can 24 workers assemble in a week?

c) In a certain week, 48 cars have to be delivered to dealerships. How many workers are needed to assemble that number of cars?

3. Two competing nurseries are offering special discounts on the price of a certain kind of houseplant. Below are the price lists posted by the two nurseries.

Good-Nursery

Number of trees	**Price**
1	\$12.50
2	\$25.00
3	\$37.50

Honest-Nursery

Number of trees	**Price**
1	\$14.50
2	\$28.00
3	\$38.50

a) Which of the two lists defines a proportional relationship between the number of trees, n, and their price, P?

b) Verify your answer by plotting the data represented in each list.

c) Write the equation that describes the relation between P and n for the list where the two variables are proportional to one another.

4. The table below lists the widths of parking spaces allocated for different numbers of cars at a parking lot.

Number of cars (n)	5	10	15	20
Width allocated (l ft)	40	80	120	160

a) Does the table define a proportional relationship between n and l?

b) Plot the ordered pairs (n, l) defined in the table.

c) Does it make sense to join the points plotted to obtain the graph of the relationship? Justify your answer.

d) Write an equation to describe the relationship between n and l. What values for n can be substituted in the equation?

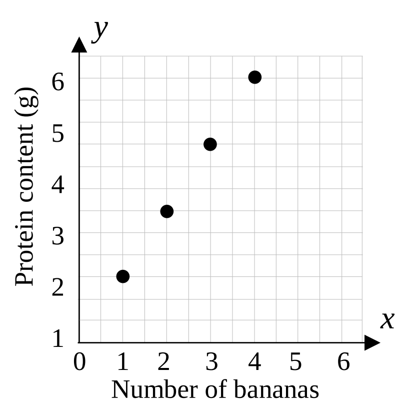
e) The management of the parking lot has a new designated area of width 206 ft for parking. How many parking spaces will this new area fit?

5. The adjacent graph shows the grams of protein in large bananas.

a) Let w be the number of grams of protein in n large bananas. Express w in terms of n.

b) How many grams of protein are in 6 bananas?

c) How many large bananas contain 15 g of protein?



Section 4 **Unit Rates**

1. Katy used 4 pounds of ground beef to prepare 12 servings of sloppy Joes. Calculate the unit rate. What does it represent in this situation?**9.** What is the average of six negative integers and their opposites? Explain how you got your answer.

2. A store has dark chocolate on special. A customer pays $6 for 12 ounces of dark chocolate.

a) What is the cost of an ounce of dark chocolate?

b) How many ounces of dark chocolate does 1 dollar buy?

c) Sketch a graph of the relationship between the number of ounces of chocolate and the price.

d) What does the slope of the graph represent?

e) Write the equation that defines the relationship between the number of ounces of chocolate and the price.

3. The fuel consumption of a compact car is described in the adjacent diagram.

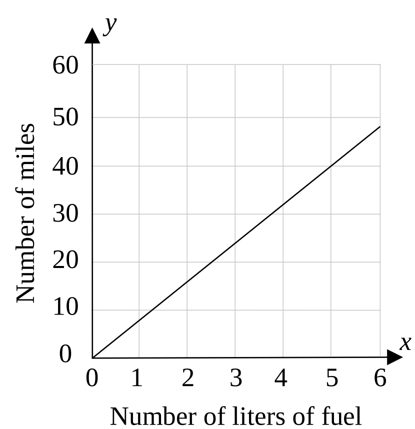
a) What does the slope of the graph represent?

b) What is the mileage per gallon for that car?

c) Write an equation to describe the fuel consumption of the car.

d) Find the number of miles the car runs on 3 liters of fuel.

e) How much fuel does a car consume in a trip of 60 miles?



Section 5 **Comparing Proportional Relationships**

1. One week, Cortney paid $17.64 for 4.5 gallons of gasoline. The following week, she paid $13.86 for 3.5 gallons of gasoline.

a) What unit rate should be used to compare the price of gasoline during the two weeks?

b) Did the price go up or down during the two weeks? By how much?

2. Counties may have different codes regulating the percentage of the area of a lot a house can be built on. Shawn bought a piece of land in a county that allows 60% of the land to be used for building a house. His brother is considering land in a different county. He listed the areas of some lots he surveyed and the areas of the houses in the table below.

Area of the lot (ft^2)	2,260	1,460	3,380	2,840
Allowed area to be built on (ft^2)	1,469	949	2,197	1,846

a) Which county allows the building of a house over a larger percentage of the area?

b) Draw the graph that represents the relationship between the area of a lot and the area that can be built on for each of the two counties.

c) What does the slope of each graph represent? Which graph is steeper?

Section 6 **The Equation of a Straight Line**

1. The line given by the equation $y = 3x + c$ passes through the point (2, –1). Find c and interpret its value.

2. The point (2, 3) lies on the graph of the equation $y = mx + 3$. Find m and interpret its value.

In 3 – 5, write the equation of the straight line passing through the given pair of points in slope-intercept form.

3. (–1, –5) and (2, 7) **4.** (0, –2) and (1, 1) **5.** $\left(1, \frac{1}{2}\right)$ and $\left(\frac{1}{2}, 1\right)$

6. An economist expects food prices to rise constantly over the next six months. He uses the equation $y = 0.1x + 12.5$ to predict the unit price in dollars of a certain food product, y after x months.

a) Describe the characteristics of the equation.

b) What do the constants in the equation represent within the context?

c) What are the ranges of values of x and y for the equation to make sense in this situation?

d) Construct a table of values within the suggested ranges and plot the graph of the relationship between x and y.

Section 7 **Graphing the Equation *y* = *mx* + *c***

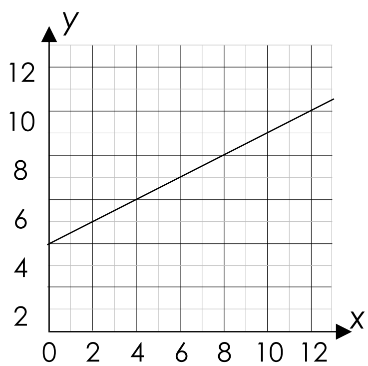
In 1 – 6, use the slope and the *y*-intercept to graph the given equation.

1. $y = 5 - 2x$ **2.** $y = -3x + 2$ **3.** $y = \frac{2x-3}{6}$

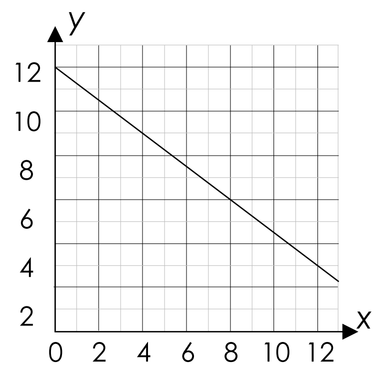
4. $y = \frac{1}{2}x - 2$ **5.** $y = -\frac{3x-5}{5}$ **6.** $y = 1\frac{1}{4} - \frac{3}{4}x$

In 7 – 8, determine the slope and the *y*-intercept of the given graph. Then write the equation that describes the graph.

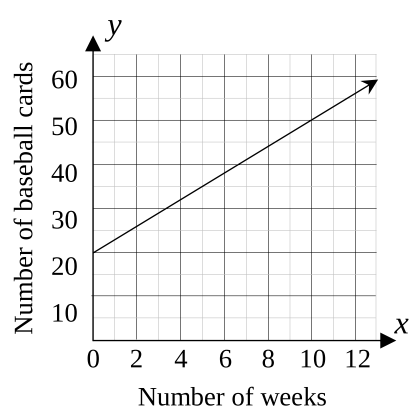
7.



8.



9. Marco had a collection of baseball cards. He set a goal to use part of his allowance in order to add a certain number of cards every week. He drew the adjacent continuous graph to help him monitor the growth of his collection.



a) What is the slope of the graph? What does it represent in this situation?

b) Identify the *y*-intercept and interpret its value within the context.

c) Construct a table that lists the number of cards in Marco's collection after he started pursuing his goal.

d) Write an equation that can be used to calculate the number of cards in Marco's collection after *x* weeks.

e) How can Marco calculate the number of cards in his collection 15 weeks after he started pursuing his goal? What is that number?

f) How can Marco calculate the number of cards in his collection a year later? What is that number?

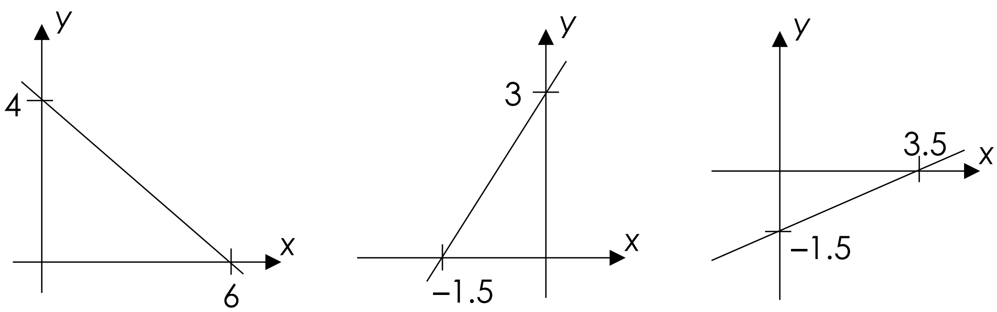
Section 8 **The Equation of the Straight Line in General Form**

In 1 – 6, rewrite the equation in the slope-intercept form and identify the slope of the graph.

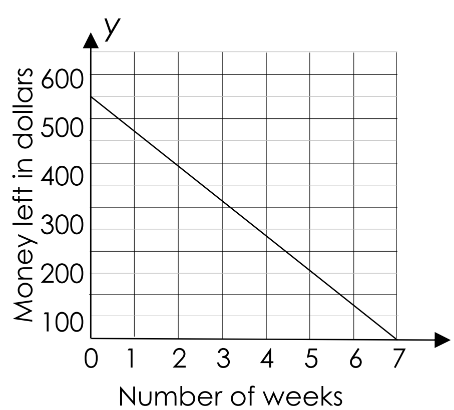
1. $2x + 4y = 1$ **2.** $3x - y = 4$ **3.** $3y - 4x = 5$

4. $4x + 5y = -2$ **5.** $y - x = 1$ **6.** $\frac{x}{2} + \frac{y}{5} = 1$

7. Write the equation of each of the following lines in the general form.



8. Steve is planning a long vacation. He is setting aside an amount of money for this vacation. Steve is planning to spend equal amounts of money each day during the vacation. The adjacent graph represents the amount left from the budget after a certain number of days.



a) What does the y-intercept represent in this situation?

b) What does the x-intercept represent in this situation?

c) What is the slope of the graph and what does it represent in this context?

d) Write an equation in the general form that relates the amount of money left after a certain number of vacation days.

e) What are the ranges of practical values the variables can assume?

f) Use the graph to estimate the money left from the budget after 5 vacation days. Verify the estimate using the equation of the graph derived in part d).

Chapter Summary TB read pages 126 – 127
Chapter Test TB pages 128 – 130

Ch. 4 Linear Equations in One Variable
Section 1 **Linear Equations in One Variable**

In 1 – 3, check whether each given value of *x* is a solution of the equation.

1. $2x + 7 = 4 - x$; $x = 1$, $x = -1$, $x = 2$

2. $4z - 2 = -2(1 - 2z)$; $z = 0$, $z = 2$, $z = -2$

3. $y - \frac{1}{2} = 3y - 1\frac{1}{2}$; $y = \frac{1}{2}$, $y = \frac{1}{3}$, $y = \frac{1}{4}$

Section 2 **Linear Equations With Variable on One Side**

In 1 – 12, solve for *x*. Check your answer.

1. $x + 5 = 3$
2. $x - 3 = 4$
3. $2x - 1 = 5$
4. $-2x + 3 = 11$
5. $11 = -3x + 2$
6. $4 - x = 3$
7. $0.5x + 2 = 1.5$
8. $0.3x + 5.4 = 2.4$
9. $2x - 3.2 = 1.6$
10. $\frac{1}{2} - x = \frac{3}{4}$
11. $\frac{2x-5}{3} = -3$
12. $\frac{3}{2} - \frac{x}{2} = \frac{1}{6}$

13. Joel paid $10 for 3 burgers and 2 soft drinks. He knows that each drink costs $1.50. He wants to calculate the price of each burger.

a) Write an equation that Joel can use to calculate the price of a burger.

b) Solve the equation to find the price of one burger and check your answer.

Section 3 **Linear Equations Involving Brackets**

In 1 – 10, solve for *x*. Check your answer.

1. $2(x + 4) = 7$
2. $3(x - 2) = 7$
3. $4(2x - 3)=15$
4. $\frac{1}{2}(x+4) = \frac{1}{3}$
5. $\frac{1}{3}\left(4 - \frac{x}{2}\right) = 2\frac{1}{4}$
6. $0.12(x - 0.5) = 0.15$
7. $2x + 3(x + 2) = 16$
8. $6(2x + 5) - 15x - 10 = 15$
9. $6(2x + 5) - 5(3x + 4) = 19$
10. $\frac{2}{5}(1+5x) - \frac{1}{2}(2-4x) = \frac{1}{2}$

In 11 – 16, determine without solving whether the linear equation has a unique solution, infinitely many solutions, or no solution. Justify your answer.

11. $5a - 2 = 9$ **12.** $2x - 6 = 2(x - 3)$ **13.** $w + 3 = w - 3$

14. $3x + 0.5 = 0.2$ **15.** $11x + \frac{1}{2} = \frac{1}{4}$ **16.** $\frac{x}{2} - \frac{1}{3} = -\frac{1}{2}$

17. Three times the sum of a number and 2 added to twice the difference between the same number and 2 equals 12.

a) Write an equation to use for finding the missing number.

b) Solve the equation and verify the answer.

Section 4 **Linear Equations With Variable on Both Sides**

In 1 – 10, solve for *x*. Check your answer when the equation has a unique solution.

1. $3x - 4 = 3x + 4$ **2.** $2x = 15 - 3x$ **3.** $-2x - 3 = 2(4 - x)$

4. $\frac{1}{3} - x = \frac{1}{5} + x$ **5.** $\frac{x}{3} + 2 = 2\left(\frac{x}{2} - 1\right)$ **6.** $\frac{2x-3}{3} = \frac{3x+2}{2}$

7. $0.2x = 0.8x - 1.2$ **8.** $0.3x + 0.4 = 0.1 + 0.3x$

9. $3(3 + x) = 5(3 - x) + 6x$ **10.** $7 - 3(1 - x) = 4 - 3x$

11. Find all possible values of *a*, if any, for which the equation $a(x - 1) = 2(x - 1)$ has:

i- a unique solution ii- infinitely many solutions iii- no solution

12. Find all possible values of *a*, if any, for which the equation $3x + 2 = 3x + a$ has:
i- a unique solution ii- infinitely many solutions iii- no solution

13. When a number is added to both the numerator and the denominator of the fraction $\frac{2}{5}$, it becomes equivalent to $\frac{3}{4}$.

a) Set up an equation to find that number.

b) Solve the equation and verify the answer.

In 14 – 15, multiply the equation by the least common denominator and find its solution.

14. $\frac{1}{3} + \frac{1}{2}(x+3) = \frac{1}{6}(x-1)$ **15.** $\frac{1}{2}x - \frac{2}{5}(2-x) = \frac{7}{10}(x+2)$

Section 5 **Linear Equations in More Than One Variable**

In 1 – 3, solve the equation once for x and a second time for y.

1. $2y = 3x + 4$ **2.** $0.2x + 0.5y = 1$ **3.** $x - \frac{y}{2} = \frac{1}{3}$

Chapter Summary TB read pages 152 – 153
Chapter Test TB pages 154 – 156

Ch. 5 Systems of Linear Equations
Section 1 Systems of Linear Equations in Two Variables

1. The lines l: $3y = 2x$ and m: $2x + 3y = 12$ intersect at P.

a) Draw l and m and identify the coordinates of P.

b) Explain why P is the midpoint of the segment joining the intercepts of $2x + 3y = 12$.

c) Show that the region bounded by l and m and the y-axis is an isosceles triangle with vertex P.

d) Show that the region bounded by l and m and the x-axis is also an isosceles triangle with vertex P.

e) Find graphically the slope of $\overline{PQ}$, where Q is at (1, 5).

Section 2 Graphical Solution of Systems of Linear Equations

In 1 – 6, graph the pair of equations to determine the number of solutions in each case.

1. $\begin{cases} y = 2x + 1 \\ y = 2x - 1 \end{cases}$ **2.** $\begin{cases} y = x + 2 \\ 2y = 2x + 4 \end{cases}$ **3.** $\begin{cases} y = 2 - 3x \\ y = x - 1 \end{cases}$

4. $\begin{cases} 1.6y = 0.4x + 2 \\ 0.4y - 0.1x = 0.5 \end{cases}$ **5.** $\begin{cases} 3x + y = 3 \\ 3x + y = 6 \end{cases}$ **6.** $\begin{cases} 3x + y = 6 \\ x + 6y = 6 \end{cases}$

7. Without solving, determine whether each system has a unique solution, infinitely many solutions, or no solution. Justify your answer.

a) $\begin{cases} 3x - 2y = 5 \\ 3x - 2y = 1 \end{cases}$ b) $\begin{cases} 3x - 3y = 6 \\ 4x - 4y = 8 \end{cases}$ c) $\begin{cases} x - 2y = 4 \\ x + 2y = 4 \end{cases}$

8. Consider the system $2x + 3y = 4$ and $2x + 3y = c$.

a) For what values of c does the system have no solution? Explain why.

b) For what value of c does the system have infinitely many solutions? Explain why.

c) Is there any value of c for which the system has a unique solution?

Section 3 **Solving Systems of Linear Equations By Substitution**

In 1 – 6, solve the system of linear equations using the substitution method and verify the solution.

1. $\begin{cases} y = x \\ x + 2y = 6 \end{cases}$ **2.** $\begin{cases} y = 2x - 2 \\ 3x + 2y = 16 \end{cases}$ **3.** $\begin{cases} y - 2x = 0 \\ 3x + y = 10 \end{cases}$

4. $\begin{cases} 0.2x + 0.3y = 12 \\ 0.3x - 0.5y = 56 \end{cases}$ **5.** $\begin{cases} y = \frac{1}{3}x + 1 \\ y = 3x - 7 \end{cases}$ **6.** $\begin{cases} 2x - 3y = 3 \\ y = \frac{2x - 15}{3} \end{cases}$

7. The point of intersection of the two lines $ax + 2by = 2$ and $2ax - by = 9$ is $(2, -3)$.

a) Find the values of a and b.

b) Graph the two lines and verify the coordinates of their point of intersection.

Section 4 **Solving Systems of Linear Equations By Elimination**

In 1 – 3, use the elimination method to determine whether the system has a unique solution, infinitely many solutions, or no solution. Verify the solution in the case when it is unique.

1. $\begin{cases} y = 3x - 5 \\ y = x - 9 \end{cases}$ **2.** $\begin{cases} 3x + 2y = 7 \\ 8x + 7y = 12 \end{cases}$ **3.** $\begin{cases} 0.1x + 3y = 8 \\ 0.2x - 5y = 5 \end{cases}$

4. The sum of two numbers is 50 and their difference is 15.

a) Write a system of linear equations that describes this situation.

b) Solve the system of linear equations obtained above to determine the two numbers. Is the solution unique?

c) Verify that the solution satisfies the given conditions.

5. Collin paid \$4 for 2 pounds of mangos and one-half pound of bananas. His friend Julia paid \$6 for 3 pounds of mangos and one and a half pounds of bananas.

a) Write a system of two equations that describes the given situation.

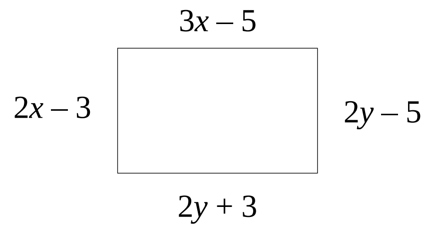
b) Solve the system obtained using the elimination method. What do you conclude?

Section 5 **Applications**

1. Consider the rectangle in the adjacent diagram.

a) Write a system of linear equations to determine the length and width of the rectangle.

b) Solve the system and verify the answer.



2. The sum of the digits in a 2-digit number is 12. If you reverse the digits, the new number is 18 less than the original number. Find the number.

3. Three pounds of russet potatoes and 2 lb of red potatoes cost $1.80.
Two pounds of russet potatoes and 3 lb of red potatoes cost $1.70.

a) Can you guess which kind of potato is more expensive? What is your reasoning?

b) Write a system of linear equations to calculate the price of 1 lb of each kind of potato.

c) Solve the system and verify the answer.

d) Find the price of 2.5 lb of russet potatoes and 2.5 lb of red potatoes. How do these prices compare to $1.70 and $1.80?

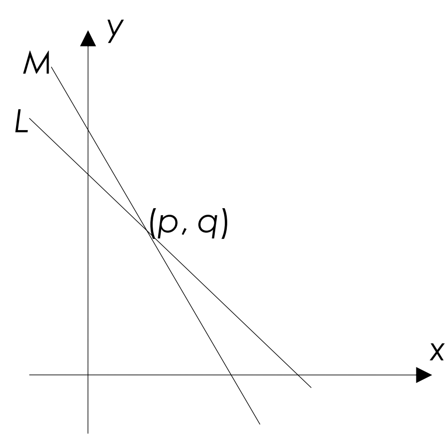
Section 6 **Comparing Linear Equations**

1. The two lines graphed in the adjacent figure are described by the equations $y = –2x + c$ and $y = –3x + d$.

a) Identify the graph of each equation.

b) What do the constants c and d represent, and which is larger?

c) What do the coordinates (p, q) represent in terms of the equations?



d) Find the vertical distance between the points on the two graphs that have an x-coordinate equal to $p + 2$.

e) On the same set of axes, sketch the graph of the line that passes through the point (p, q) and that is described by the equation $2y = –3x + e$. How is e related to c and d?

2. Chloe is planning her birthday party. She has the choice between three ballrooms that offer complementary DJ music.

- The first ballroom offers a banquet buffet at $16 per person.
- The second ballroom charges $300 for the room rental in addition to $11 per person for the buffet.
- The third ballroom charges $500 for the room rental in addition to $9 per person for the buffet.

Chloe does not know exactly how many guests she will invite, but she anticipates no more than 120.

a) Draw the graph that represents the relationship between the number of guests and the total cost for each room.

b) What do the *y*-intercept and the slope represent for each graph?

c) Derive an equation that describes the relationship between the number of guests and the total cost for each room.

d) How would Chloe make her choice between the three ballrooms based on the number of guests she will invite?

Chapter Summary TB read page 189 – 190
Chapter Test TB pages 191 – 193

Ch. 6 **Functions**
Section 1 **Definition of a Function**

1. The adjacent price list is posted at the entrance of a school cafeteria. Does this list define a function where the input is represented by the first column? Justify your answer.

Item	**Price**
Milk	$1.25
Juice	$1.75
Soda	$1.50
Water	$1.00

2. The table below shows Dan's earnings during the workdays of a certain week.

Day	Mon	Tue	Wed	Thu	Fri
Earnings	$64	$56	$64	$64	$64

Does the table define a function? Justify your answer.

3. Consider the following input-output table.

Input	Triangle	Quadrilateral	Pentagon			
Output	0	2	5			

a) Describe in words the relationship between the input to the output.

b) Complete the table.

c) Does the table define a function? Explain.

Section 2 **Defining a Function Numerically**

1. Consider the set of ordered pairs: $\left(1,1\frac{1}{2}\right), \left(3,3\frac{1}{2}\right), \left(5,5\frac{1}{2}\right), \left(7,7\frac{1}{2}\right)$.

a) Does the set define a function? Why?

b) Describe the associated rule in words.

c) What is the output when the input is –3?

d) What is the input when the output is 10.5?

2. Consider the following function table.

Input: x	1	2	3	4	5		8
Output: y	3	7	11	15		27	

a) Complete the table.

b) Describe a function rule that shows the relationship between the input, x, and the output, y.

3. Consider the following function table.

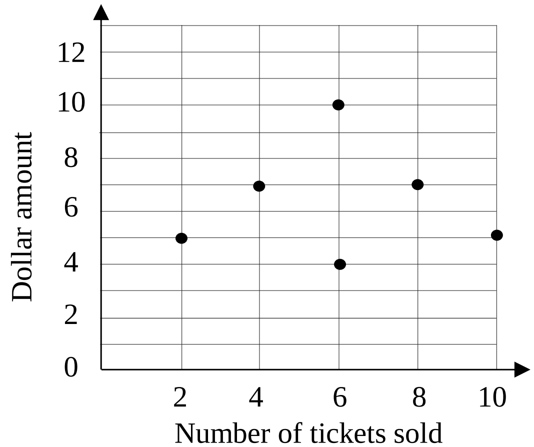
Input: x	1	2	3	4	5		8
Output: y	3	7	11	15		27	

a) Complete the table.

b) Describe a function rule that shows the relationship between the input, x, and the output, y.

Section 3 **Defining a Function Graphically**

1. Lara volunteered to sell raffle tickets at a fundraiser event. Tickets are available in different dollar amounts. She summarized the number of tickets she sold from each dollar amount in the adjacent graph.



a) How many $10 tickets did Lara sell?

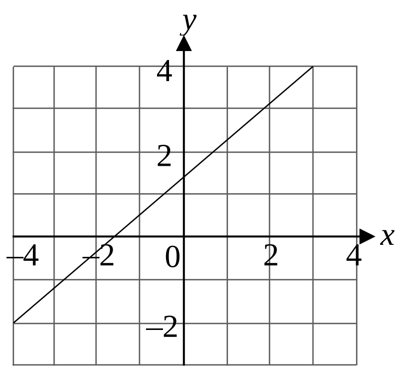
b) How many $4 tickets did Lara sell?

c) If we know the number of tickets Lara sold, can we predict a unique dollar amount to which these tickets belong?

d) Does the graph define a function? Justify your answer.

In 2 - 3, determine whether the graph describes a function.

2.



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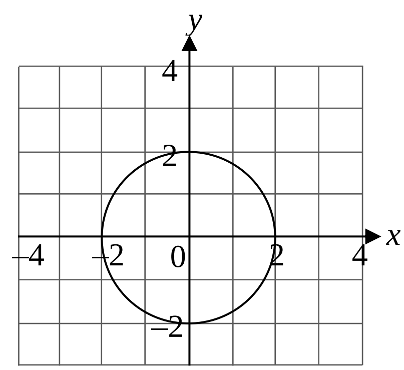
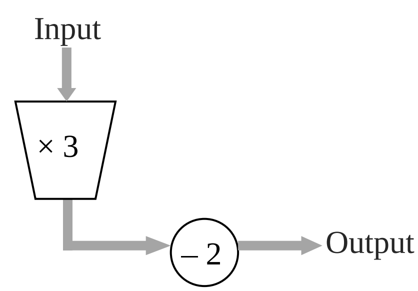


Section 4 **Defining a Function Algebraically**

1. Consider the function machine in the adjacent diagram. The input is any real number.



a) Describe the rule of this function in words.

b) Complete the following input-output table.

Input	–1	0	1	2
Output				

c) Draw the graph of the function in the coordinate plane.

d) Identify the slope of the graph.

e) Denoting the input by x and the output by y, write an equation that describes the relationship between x and y.

2. A function rule is given by the equation $y = 4 - x^2$, where the input, x, is any real number.

a) Explain why the equation describes a function.

b) Complete the following table of values.

x	–2	–1	0	1	2
y					

c) Use the table above to plot the graph of the function in the coordinate plane.

d) Describe the main features of the graph of the function.

Section 5 **Linear Functions**

In 1 - 2, plot the points presented in the table and determine whether the given data defines a linear function.

1.

Input: x	1	2	4	5	7	8
Output: y	–0.5	2	7	9.5	14.5	15.5

2.

Input: x	0	3	5	6	8	9
Output: y	1	3	5	7	9	11

3. A shop produces bolts of different sizes. The following table lists the diameter, d, and the length, l, of the different sizes of bolts produced.

Diameter (mm) d	3	5	7	14
Length (cm) l	1.5	3	6	12

a) Does the table define the length, l, as a linear function of the diameter, d? Justify your answer.

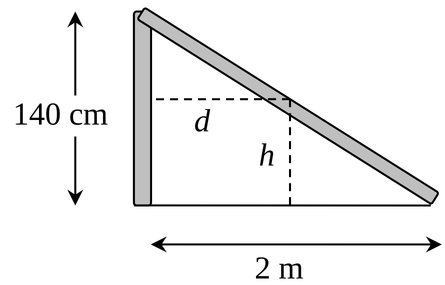
b) Plot the graph of the relationship between d and l using the points given in the table and verify your answer in the part above.

Section 6 **Representing Linear Functions Algebraically**

In 1 - 3, determine whether the equation defines a linear function. If so, express y as a function in x, determine the slope and the y-intercept of its graph, and sketch this graph in a coordinate plane.

1. $y = 4 - 2x$ **2.** $\frac{2}{x} + 3y = 1$ **3.** $y - x = 2$

4. The adjacent diagram shows the dimensions of a children's slide at City Park. The height, *h*, of any point on the slide is a linear function of its horizontal distance from the vertical support of the slide, *d*.



a) Identify two corresponding pairs (d, h) from the information given.

b) Use the ordered pairs to find an equation that describes the relationship between *h* and *d*.

c) Express *h* as a function in *d*.

d) Draw the graph of the function.

e) What is the slope of the graph and what is its interpretation within the context?

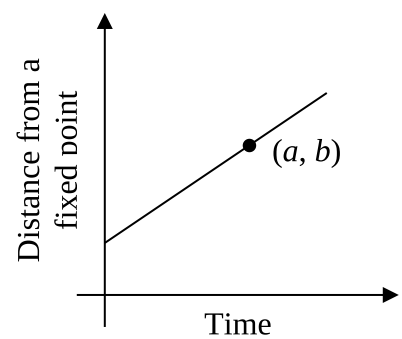
f) Identify the axes-intercepts and give the interpretations of their values within the context.

g) Calculate the height of a point that is 80 cm away from the vertical support of the slide.

In 5 - 7, the equation describes the rule of a function. Find the rate of change of this function and interpret its value.

5. $3y = 4 - x$ **6.** $y - 2x = 0$ **7.** $y - 2 = 0$

8. The adjacent travel graph describes the motion of a traveling object. The horizontal axis represents the time and the vertical axis represents the distance of the object from a fixed point.



a) What does the *y*-intercept represent in this situation?

b) What is the interpretation of the slope of the graph in this context?

c) If the point (a, b) lies on the graph, what does each of its coordinates represent?

Section 7 **Comparing Linear Functions**

1. Rodney compares the price plans to download music offered by two websites. Site *A* charges a signup fee of \$6 in addition to \$1.50 per song. Site *B* charges download fees as listed in the following table.

Number of songs	10	20	25	40
Cost (\$)	22.5	35	41.25	60

a) Compare the rates per download of the two sites.

b) Write an equation to define the total cost, C, of downloading n songs for each of the two sites.

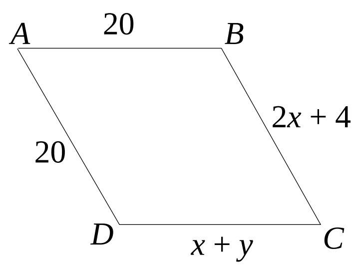
c) Which of the two companies charges a higher signup fee?

d) By solving the equations derived above, find the number of downloads that would cost the same for both plans.

Chapter Summary TB read pages 36 – 37
Chapter Test TB pages 38 – 41

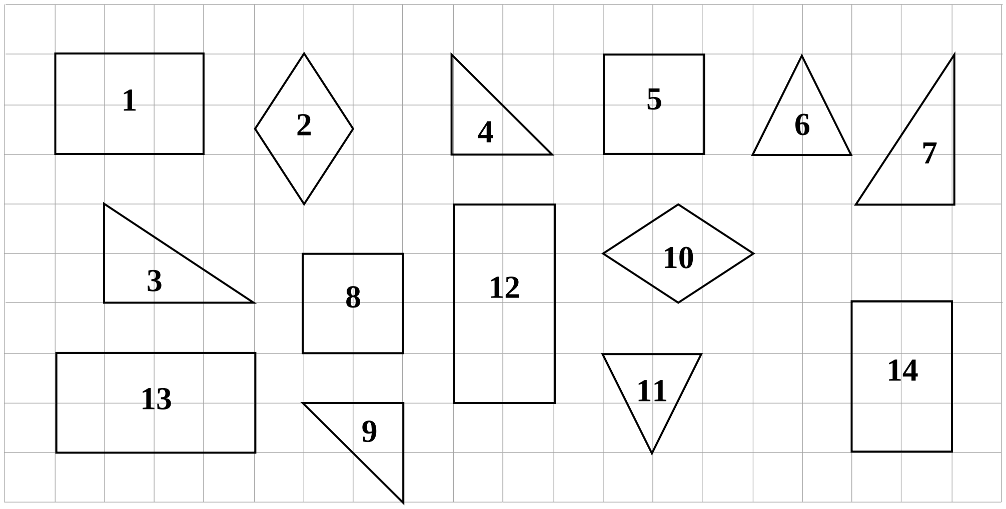
Ch. 7 **Congruence Transformations**
Section 1 **Congruency of Geometric Shapes**

1. *ABCD* is a rhombus.



Use the fact that all sides of a rhombus are congruent to find the value of each of x and y.

2. Identify the pairs of congruent shapes in the following diagram.



3. Given that $\Delta BEC \cong \Delta POR$, fill in the spaces in each of the following statements.

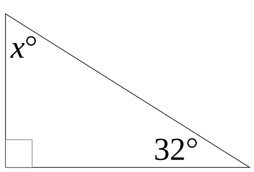
a) BC = _____ b) PO = _____ c) EC = _____

d) $\angle ECB \cong \angle$_____ e) $\angle POR \cong \angle$_____ f) $\angle CBE \cong \angle$_____

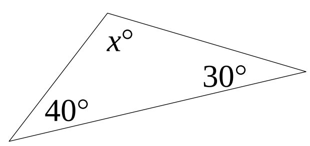
Section 2 **Translations**

In 1 – 3, find the value of x in each case.

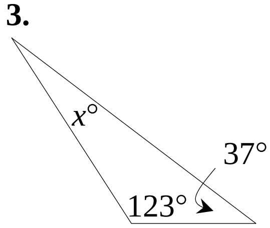
1.



2.



3.

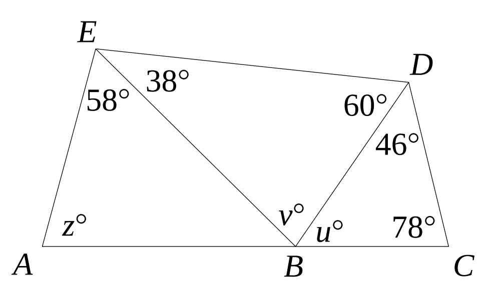


4. Consider the adjacent figure where A, B, and C are collinear.

a) Find the value of u.

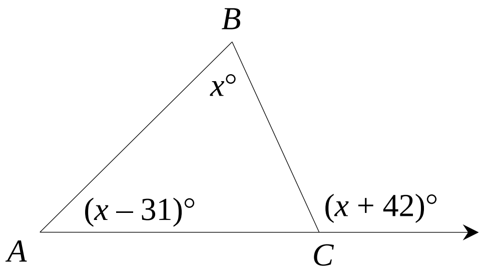
b) Find the value of v.

c) Deduce the value of z

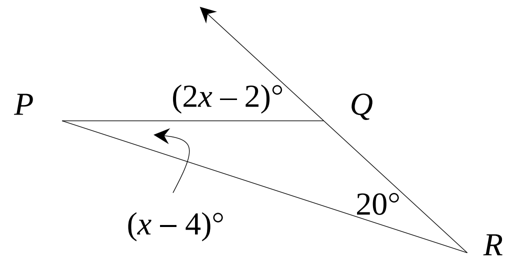


5. Find the value of x in each of the following triangles and determine the measures of the angles of each triangle. Verify that the sum of these measures is 180°.

a)



b)



Section 3 **Translation in the Coordinate Plane**

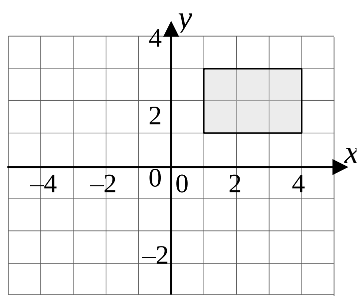
In 1 – 2, describe the translation that takes the point P to P' and find the image of Q under this translation.

1. $P(1, 4)$, $P'(4, 2)$, and $Q(0, 0)$

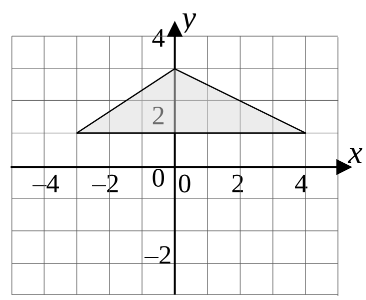
2. $P(-1, -3)$, $P'(5, 6)$, and $Q(4, 4)$

In 3 – 5, draw the image of the geometric shape under the given translation. Write the coordinates of the vertices of each shape and its image. Verify that translations take line segments into congruent line segments, angles to congruent angles, and parallel lines into parallel lines.

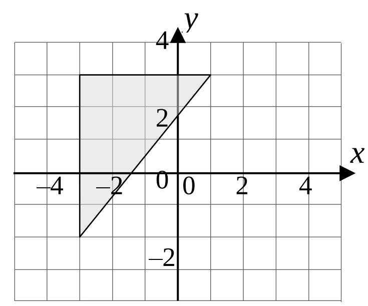
3. Shift 5 units to the right



4. Shift 4 units down



5. Shift 2 units to the right

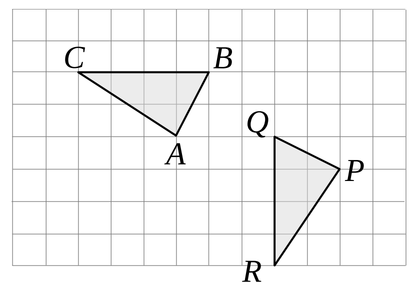


Section 4 **Rotations**

1. Line segments $\overline{BC}$ and $\overline{QR}$ have the same length.

a) Describe a rotation followed by a translation that map segment $\overline{BC}$ to $\overline{QR}$.

b) If we apply the transformation defined above, can we prove that the two triangles ABC and PQR are congruent? Explain why and identify the congruent parts of the two triangles.

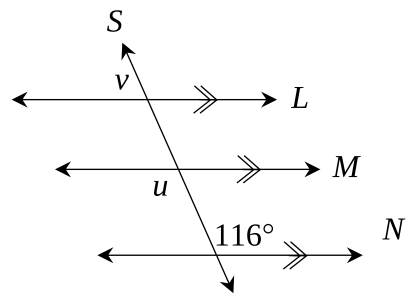


2. In the adjacent diagram, the transversal *S* intersect the parallel lines *L*, *M*, and *N*.

a) Find the measure of the angle labeled *u* and state the properties used.

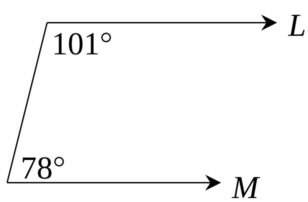
b) Find the measure of the angle labeled *u* and state the properties used.

c) Mark all angles that have a measure of 64°.

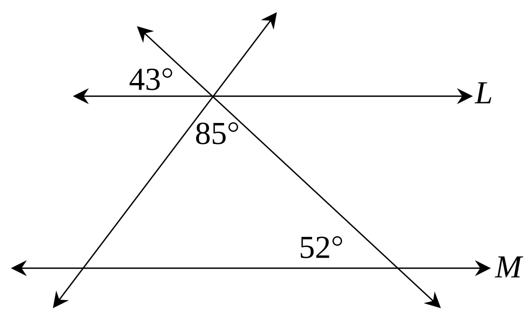


In 3 – 6, determine whether the lines *L* and *M* are parallel. Justify your answer. (Figures are not drawn to scale.)

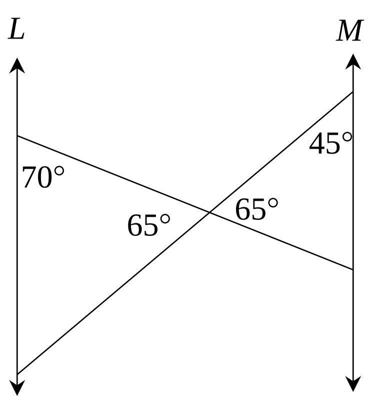
3.



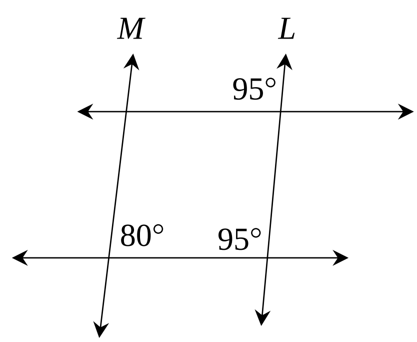
4.



5.



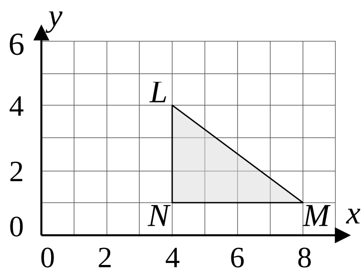
6.



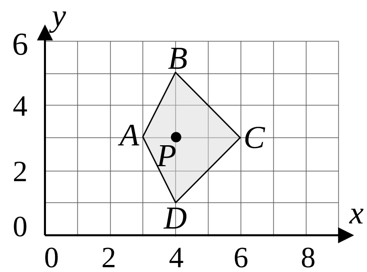
Section 5 **Rotations in the Coordinate Plane**

In 1 – 3, draw the image of the polygon under the given rotation given in each case. Write the coordinates of the vertices of the polygon and the coordinates of the vertices of its image.

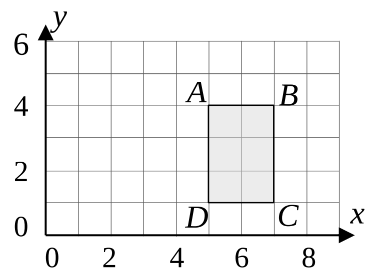
1. Counterclockwise rotation of 90° about *N*



2. Counterclockwise rotation of 90° about *P*



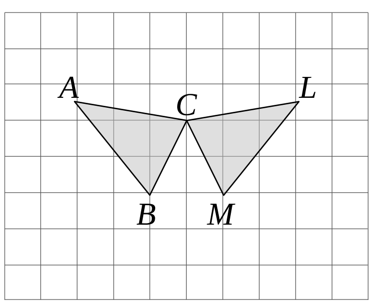
3. Counterclockwise rotation of 90° about *D*



Section 6 **Reflections**

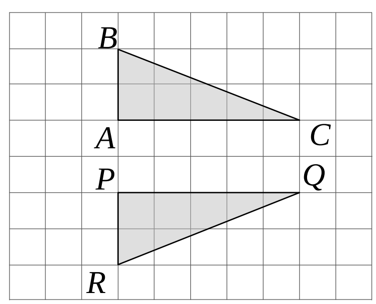
In 1 – 3, the two triangles drawn are congruent. Complete the congruency statement below the figure and describe a simple transformation that takes ΔABC to the corresponding image in each case.

1.



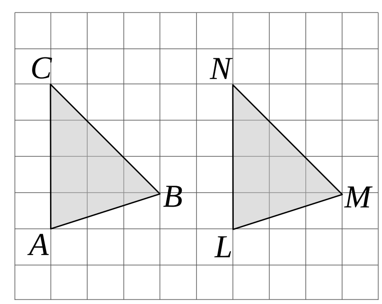
$\Delta ABC \cong \Delta$______

2.



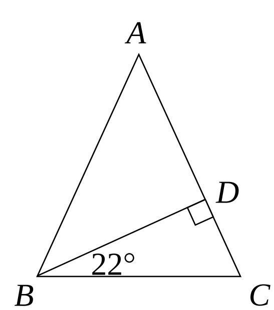
$\Delta ABC \cong \Delta$______

3.

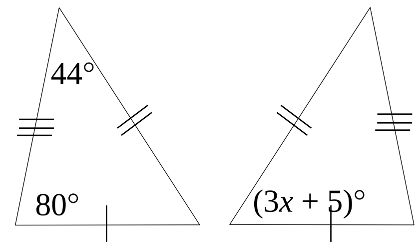


$\Delta ABC \cong \Delta$______

4. The figure on the side shows the isosceles triangle *ABC* with *AB* = *AC*, and $\overline{BD}$ is perpendicular to $\overline{AC}$. Calculate the measures of the angles of ΔABC.



5. The triangles drawn in the adjacent figure are congruent. Find the value of x.



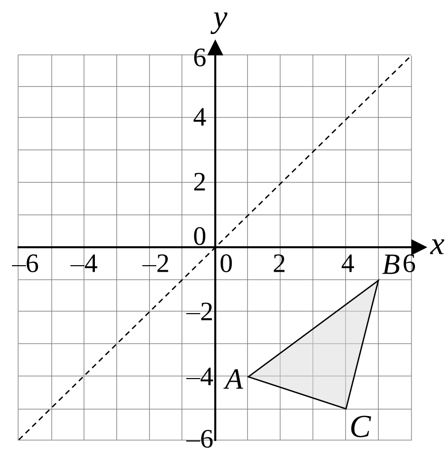
Section 7 **Reflections in the Coordinate Plane**

In 1 – 3, find the reflection of the given point once over the x-axis and a second time over the y-axis.

1. $R(-1, -3)$ **2.** $Q(-3, 2)$ **3.** $B(0, 2)$

4. Find the reflection of the line segment joining the points $A(3, 3)$ and $B(5, 7)$ over the line $y = x$.

5. In the adjacent figure, ΔABC has vertices $A(1, -4)$, $B(5, -1)$, and $C(4, -5)$. Draw the image of its reflection over the straight line $y = x$, and identify the coordinates of the vertices of this image.



Chapter Summary TB read pages 69 – 70
Chapter Test TB pages 71 – 73

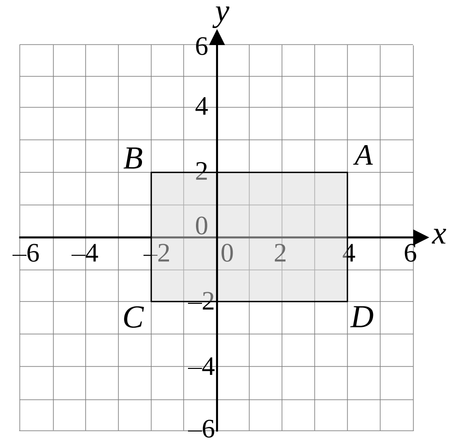
Ch. 8 Similarity Transformations

Section 1 Dilation

In 1 – 3, apply a dilation centered at the origin with the given scale factor, k, to find the image of the point. Plot the point along with its image in the coordinate plane.

1. $M(2, -4)$, $k = \frac{3}{2}$ **2.** $A(2, 3)$, $k = \frac{1}{2}$ **3.** $C(3, -2)$, $k = 2$

4. The rectangle with vertices $A(4, 2)$, $B(-2, 2)$, $C(-2, -2)$, and $D(4, -2)$ is subjected to a dilation centered at the origin with a scale factor $\frac{1}{2}$.

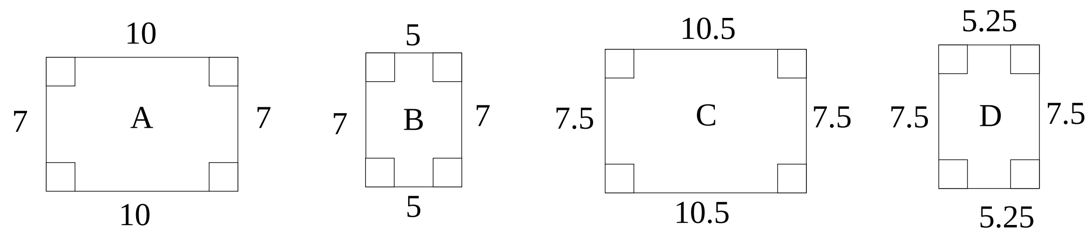


a) Find the coordinates of the image of the rectangle under the prescribed dilation algebraically.

b) Determine the image of the dilation graphically and verify the coordinates of the vertices obtained above.

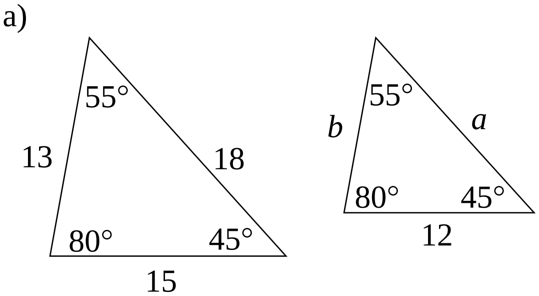
Section 2 Similar Figures

1. Which two rectangular shapes are similar? Justify your answer.

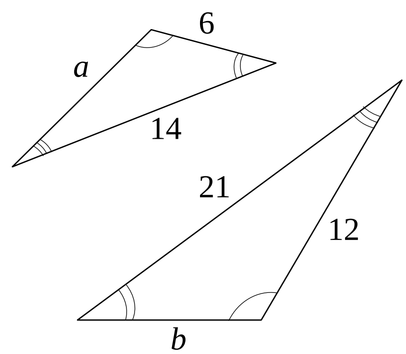


2. Each pair of triangles is similar. Find the missing sides in each case.

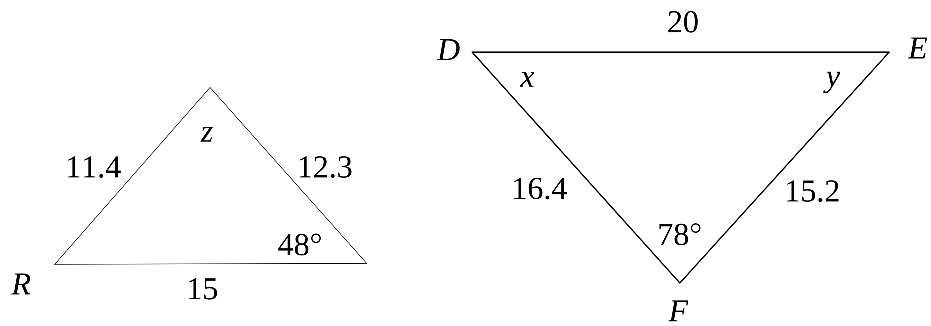
a)



b)



3. The diagram below represents a pair of similar triangles. Write a similarity statement and find x, y, and z.



Section 3 **Similarity Transformations**

1. The points $A(3, 3)$, $B(6, 4.5)$, and $C(3, 6)$ form the vertices of an isosceles triangle.

a) Find $\Delta A'B'C'$, the image of ΔABC under a dilation centered at the origin with scale factor $\frac{4}{3}$. Verify your results graphically.

b) Draw ΔPQR, the image of $\Delta A'B'C'$ under a reflection over the y-axis.

c) Is ΔPQR isosceles? How is this justified?

d) Is the composite transformation that maps ΔABC to ΔPQR a rigid transformation?

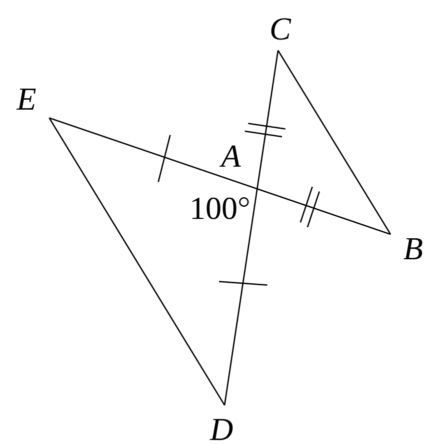
e) Write statements to describe the relations between the angles and sides of triangles ABC and PQR.

2. In the adjacent figure, $\overline{EB}$ and $\overline{CD}$ intersect at A. ΔAED and ΔCAB are isosceles.

a) Find the measures of the angles of each triangle.

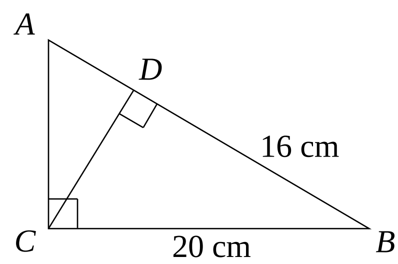
b) Are the two triangles similar? Justify your answer.

c) Is $\overline{ED}$ parallel to $\overline{CB}$? Why?



Section 4 **The Pythagorean Theorem**

1. The adjacent figure shows a right triangle *ABC* with $CD \perp AB$, *BC* = 20, and *BD* = 16.



a) Find *AB*.

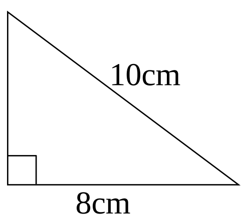
b) Find *AC*.

c) Deduce the value of *CD*.

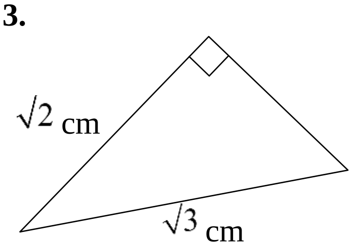
d) Verify that $(CD)^2 = (AD) \times (\mathrm{DB})$

In 2 – 4, calculate the length of the missing leg and determine whether it is rational or irrational. Using a calculator, find the irrational lengths to two decimal places.

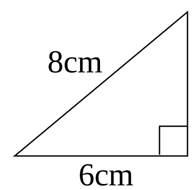
2.



3.

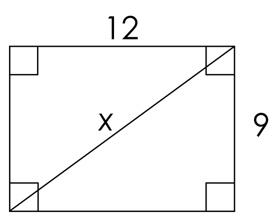


4.

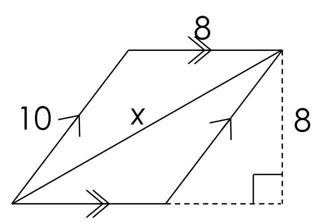


In 5 – 8, find the value of *x*.

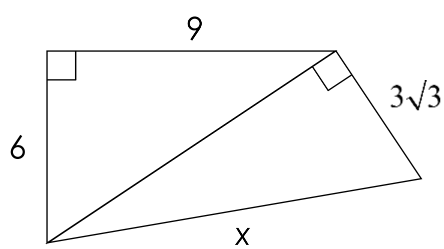
5.



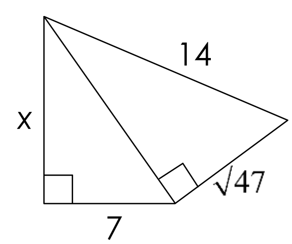
6.



7.



8.



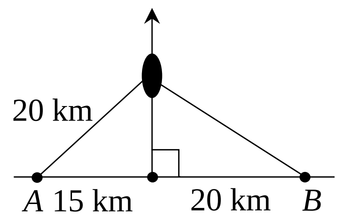
Section 5 **Applications of the Pythagorean Theorem**

In 1 - 2, show that the triangle with vertices *P*, *Q*, and *R* is right.

1. $P(2, 6)$, $Q(7, 6)$ and $R(3, 4)$

2. $P(–4, 3)$, $Q(–2, 8)$ and $R(3, 6)$

3. A boat is sailing away from a seashore due North. After some time, it was located at a distance of 20 km from lighthouse *A* that lies 15 km west of the departure point. How far is the boat from lighthouse *B* that lies 20 km east of the departure point?



Chapter Summary TB read pages 94 – 95
Chapter Test TB pages 96 – 98

Ch. 9 Volumes
Section 1 **Spheres**

1. The radius of one sphere is 10 in. and the radius of another is 20 in. Compare the volumes of the spheres.

2. Earth has an average radius of about 3,960 miles. The layer containing the ozone gas, known as the ozone layer, is a region in the upper atmosphere at altitudes between 10 and 20 miles.

a) Calculate the volume of the Ozone layer. Use $\pi \approx 3.14$ and round your answer to the nearest cubic mile.

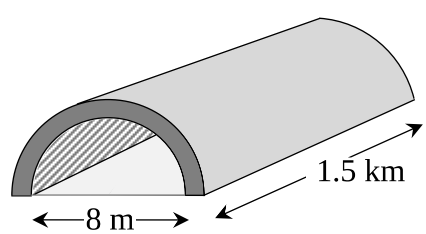
b) The atmosphere of the earth extends about 100 miles above its surface. What fraction of the volume of the atmosphere does the volume of the ozone layer represent?

3. The diameter of a Ping-Pong ball is 40 mm. How does its volume compare to the volume of a soccer ball that has a diameter of 24 cm? Use $\pi \approx \frac{22}{7}$.

Section 2 **Cylinders**

1. A cylindrical water tank is 1.25 m high and it has a capacity of 2,000 liters. Find the radius of the tank to the nearest centimeter. (1 liter = 1,000 cm^3)

2. A 1.5-km semi cylindrical tunnel has inner diameter of 8 m. The concrete walls of the tunnel are 40 cm in thickness. Calculate the volume of the concrete used to build the walls of the tunnel.



3. A cubic piece of brass that has a side of 10 cm is melted and shaped as a cylinder.

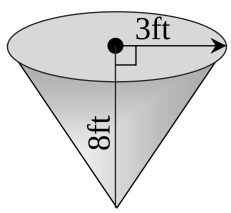
a) Calculate the height of the cylinder if it has diameter is 10 cm.

b) If instead the cylinder formed has a height of 10 cm, find its diameter.

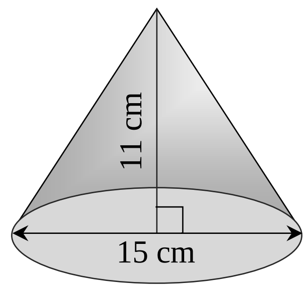
Section 3 **Cones**

1. Find the volume of each of the following cones. Use $\pi \approx 3.14$ and round each answer to two decimal places.

a)



b)

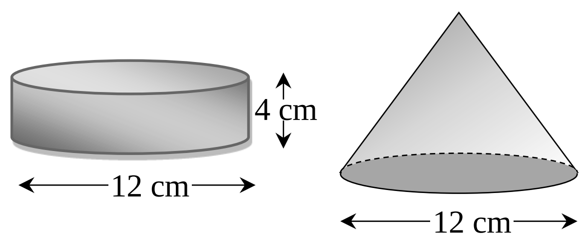


2. The volume of a cone is 50 cm^3 and its height is 6 cm. Calculate the area of its base.

3. The cylinder and the cone in the adjacent figure have the same volume.

a) Calculate the height of the cone.

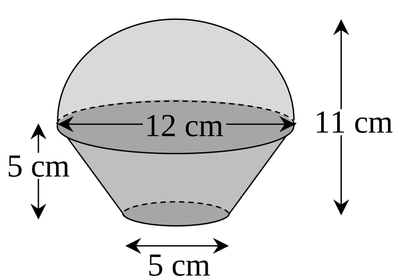
b) Find the ratio between the heights of the two shapes.



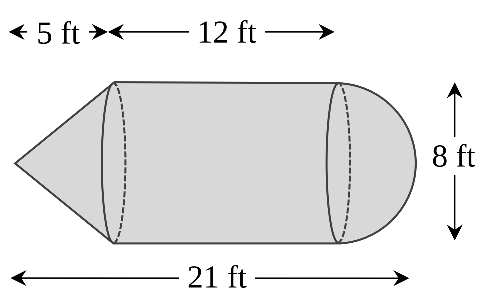
Section 4 **Composite Three-Dimensional Shapes**

1. Find the volume of each of the following composite solids. Use $\pi \approx 3.14$ and round the answers to two decimal places.

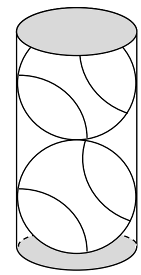
a)



b)



2. Two tennis balls with diameter 2.5 inches each are packed snuggly in a cylindrical box.



a) Calculate the dimensions of the box.

b) Find the volume of the space left inside the box after stacking the two balls.

Chapter Summary TB read page 117
Chapter Test TB pages 118 – 120

Ch. 10 **Bivariate Data**
Section 1 **Scatterplots**

1. The systolic blood pressure (Sys.) is the top number in blood pressure readings and the diastolic (Dias.) pressure is the bottom one. The two readings taken for a group of persons are listed in the table below.

Sys.	Dias.		Sys.	Dias.		Sys.	Dias.		Sys.	Dias.
137	81		115	72		122	66		128	76
112	57		154	90		118	65		133	75
132	85		115	75		96	59		117	82
114	71		120	82		122	71		126	85
111	67		116	83		111	67		113	78
110	82		132	77		126	83		126	78
114	72		128	83		131	80		121	84
125	74		121	76		132	70		119	69
138	86		135	82		105	65		116	76
114	71		113	65		110	80		116	66

a) Take the diastolic blood pressure as the independent variable and draw a scatterplot for the data given in the table.

b) Describe any association observed between the two blood pressure readings.

c) Group the data into intervals and find the average systolic blood pressure for the persons lying within each interval.

d) Analyze the table of grouped data and compare the results to the conclusion drawn in part b) above.

e) Do you expect the behavior of the graph to be the same if the systolic blood pressure is taken as the independent variable?

In 2 - 5, identify the dependent and the independent variables and discuss the cases where you think the variables do not depend on each other.

2. The green areas in neighborhoods and the levels of carbon dioxide

3. The average temperature during a summer week and the number of people going to the lake

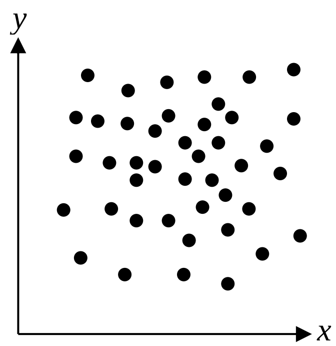
4. The circumference of the trunk of a tree and its height

5. The price of gas over a weekend and the average number of miles driven by families going on trips

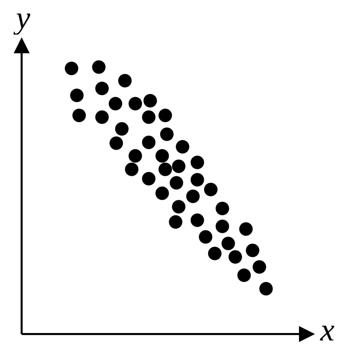
Section 2 **Types of Associations**

In 1 - 3, study the scatterplot given and identify any existing association between the variables. Describe the type (linear or nonlinear), the trend (increasing or decreasing), and the strength (perfect, strong, moderate, weak) of the association.

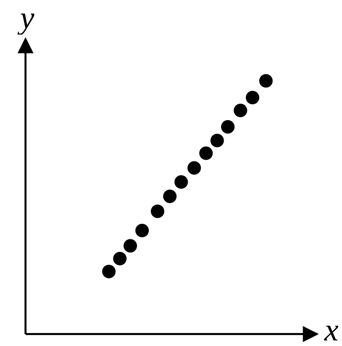
1.



2.



3.



4. The table below shows the height and the mass of nine high school students.

Height (cm)	170	135	160	120	130	164	180	124	142
Mass (kg)	76	61	72	48	56	58	85	52	62

a) Which variable can be chosen as the independent variable?

b) Draw the scatterplot of the data after identifying an independent and a dependent variable.

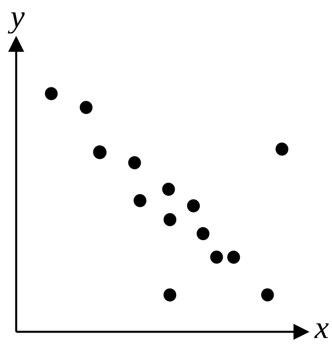
c) Describe the association between the height and the mass of students.

d) Identify any existing outliers.

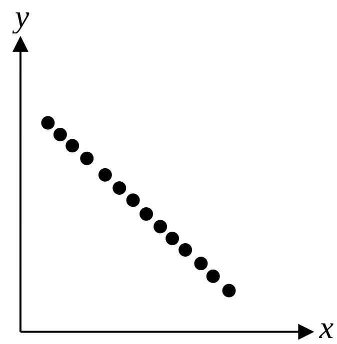
Section 3 **Linear Associations**

In 1 - 3, describe the association between the variables and draw a straight line that fits the points of the graph.

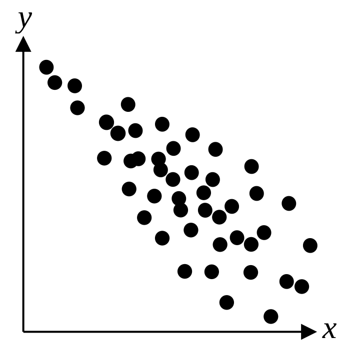
1.



2.



3.



In 4 - 5, draw the scatterplot of the given data and graph a straight line that fits the points plotted.

4.

x	0	2	4	6	8	10	12	14	16	18
y	10.5	9.3	8.7	7.5	6.2	5.7	4.5	3.8	2.4	1.5

5.

x	5	8	2	9	12	11	7	6	8	10
y	20	16	25	15	12	13	18	20	17	14

6. Ten years ago, Mason planted a tree in his backyard. At that time, the trunk of the tree had a diameter of 2.8 in. In the years that followed, Mason recorded the diameter of the trunk of his growing tree in the following table.

Number of years since plantation	0	1	3	5	6	7	9	10
Diameter (in.)	2.8	4	5.2	6.4	6.8	8	8.8	9.6

a) Which row represents the values of the independent variable?

b) Graph the scatterplot of the data listed in the table.

c) Draw a straight line that fits the points plotted.

d) What is the slope of the line drawn and what does it represent?

Section 4 **Linear Models**

1. Carter is on a special program to lower his cholesterol. The following table shows the cholesterol level in his blood after a few weeks from the start of his program.

Number of weeks	1	2	3	4	6	7
Cholesterol level	262	250	246	238	222	214

a) Plot the data listed in the table.

b) How is the cholesterol level progressing with time?

c) Draw a straight line that fits the points plotted.

d) What is the slope of the line and what does it represent?

e) Find the equation of the line drawn to fit the data.

f) Estimate the cholesterol level five weeks after Carter started his program.

2. The following table records the price of a share of a company for the first six months of a certain year.

Month	1	2	3	4	5	6
Share price ($)	10	12	14	14	16.25	17

a) Plot the data listed in the table.

b) How is the price of the share changing throughout the first half of the given year?

c) Draw a straight line that fits the points plotted.

d) What is the slope of the line and what does it represent?

e) Find the equation of the line drawn to fit the data.

f) Estimate the price of the share by the end of the given year assuming the price of the share keeps the same trend.

Section 5 **Associations in Categorical Data**

1. A group of persons were asked about their shopping preferences. The results are summarized in the table below.

	Internet	Mall
Female	18	32
Male	25	45

a) Construct a proper frequency table to study the effect of gender on shopping habits.

b) What percentage of the persons surveyed prefer shopping on the internet?

c) Is there evidence females prefer shopping on the internet more than males?

d) Create a divided bar graph to illustrate the association between gender and methods of shopping.

2. An online music store surveyed a sample of its customers about their music preference. The customers were divided in 3 age groups and the results of the survey are listed below.

	Country	Rap	Rock
Younger than 20	25	50	40
Aged 20 - 40	20	25	35
Older than 40	20	12	15

a) Construct a proper relative frequency table to study the association between the age group and the type of preferred music.

b) What percentage of the customers older than 40 prefer listening to country music?

c) What percentage of the group surveyed prefer to listen to rock music?

d) What percentage of those who prefer rap music are younger than 20 years?

e) What is the preferred type of music in each age group?

f) Is there enough evidence to establish an association between the age group and the type of preferred music? How did you reach this conclusion?

Chapter Summary TB read pages 151 – 153
Chapter Test TB pages 154 – 158