Updated 02/18/04

Integrated Mathematics 3

Integrated Mathematics 3 continues students' study of topics from algebra, geometry, and statistics in a problem-centered, connected approach. Functions and the deductive methods of proof with geometric concepts are the principle topics of study. Students will be expected to describe and translate among graphic, algebraic, numeric, tabular, and verbal representations of relationships and use those representations to solve problems. Appropriate technology, from manipulatives to calculators and application software, should be used regularly for instruction and assessment.

Prerequisites

- ***Use the trigonometric ratios to model and solve problems.***
- ***Apply geometric properties and relationships to solve problems.***
- ***Use systems of linear equations or inequalities to model and solve problems.***
- ***Define and use linear and exponential functions to model and solve problems.***

Updated 02/18/04

Integrated Mathematics 3

GOAL 1: The learner will perform operations with numbers and algebraic expressions to solve problems.

1.01 Write equivalent forms of algebraic expressions to solve problems.
1.02 Use algebraic expressions, including iterative and recursive forms, to model and solve problems.
1.03 Simplify and perform operations with rational exponents and logarithms to solve problems.
1.04 Model and solve problems using direct, inverse, combined and joint variation.

GOAL 2: The learner will use properties of geometric figures to solve problems.

2.01 Use logic and deductive reasoning to draw conclusions and solve problems.
2.02 Apply the properties, definitions, and theorems of angles and lines to solve problems and write proofs.
2.03 Apply the properties, definitions, and theorems of two-dimensional figures to solve problems and write proofs:
a) Triangles.
b) Quadrilaterals.
c) Other polygons.
d) Circles.
2.04 Use the law of sines and law of cosines to solve problems.

GOAL 3: The learner will use relations and functions to solve problems.

3.01 Use systems of two or more equations or inequalities to model and solve problems; justify results. Solve using tables, graphs, matrix operations, and algebraic properties.
3.02 Use quadratic functions and inequalities to model and solve problems; justify results.
a) Solve using tables, graphs, and algebraic properties.
b) Interpret the constants and coefficients in the context of the problem.
3.03 Use rational equations to model and solve problems; justify results.
a) Solve using tables, graphs, and algebraic properties.
b) Interpret the constants and coefficients in the context of the problem.
c) Identify the asymptotes and intercepts graphically and algebraically.
3.04 Use equations and inequalities with absolute value to model and solve problems; justify results.
a) Solve using tables, graphs, and algebraic properties.
b) Interpret the constants and coefficients in the context of the problem.
3.05 Transform functions in two dimensions; describe the results algebraically and geometrically.

Vocabulary
Concepts
Skills

1.01 Write equivalent forms of algebraic expressions to solve problems.

Vocabulary
Concepts
Skills

1.02 Use algebraic expressions, including iterative and recursive forms, to model and solve problems.

Vocabulary Concepts Skills

Inverse Relationship

Laws of Exponents

Laws of Logarithms

Base

Common Logarithms

Natural Logarithms

e

Radical

1.03 Simplify and perform operations with rational exponents and logarithms to solve problems.

A. Given that log 2.72 = 0.4346, approximate the following without a calculator: log 0.272, log 272, and log 0.00272.

B. Simplify: $\frac{1+5^{\frac{1}{2}}}{3-5^{\frac{1}{2}}}$ and $\frac{1+\sqrt{5}}{3-\sqrt{5}}$.

C. Rewrite $4 = 3^x$ in logarithmic forms (base 3, base 10, and base e).

D. Solve $663 = 49 \bullet 2.165^x$ for x. Justify each step.

E. Solve $350 = 200e^{2r}$ for r. Justify each step.

F. Solve $e^{\frac{1}{2}x} e^{3x} = 5$ for x. Justify each step.

G. The number of airline passengers increased from 465.6 million in 1990 to 614.3 million in 1998. What was the average annual growth rate (percent) for the 1990-98 period?

H. The wind chill (WC) is a measure of the heat loss from the body when temperature and wind speed are combined. The relationship is expressed algebraically as follows:
$WC\ (^{o}F) = 35.74 + 0.6215T - 35.75V^{0.16} + 0.4275T(V^{0.16})$ where
T = air temperature (^{o}F) and V = wind speed (mph).
A wind chill less than -20^{o}F is dangerous because human flesh can freeze within one minute. What wind speed will generate a wind chill of -20^{o}F when the air temperature is 6^{o}F? What air temperature will generate a wind chill of 32^{o}F when the wind speed is 35 mph?

I. The median family income in 1947 was $3031. According to the US Census Bureau, that same income in 1997 dollars is $20,102. Determine the annual inflation rate (percent) for the period 1947-1997.

Vocabulary
Concepts
Skills

Independent

Dependent

1.04 Model and solve problems using direct, inverse, combined and joint variation.

A. The formula for the volume (V) of a frustum of a cone (a horizontal slice of a cone) is given by $V = \frac{1}{3}h(B_1 + B_2 + \sqrt{B_1B_2})$, where h is the height, B_1 is the area of the lower base, and B_2 is the area of the lower base. Describe the volume as a variation with respect to the independent variables. Rewrite the formula for height in terms of the volume and areas of the bases and describe the height as a variation in terms of those quantities.

B. The electrical resistance of a wire varies directly as its length and inversely as the square of its diameter. If the resistance of 175 meters of wire having a diameter of 0.4 centimeters is 1.5 ohms, find the resistance of 300 meters of wire having a diameter of 0.25 centimeters.

C. The period of a simple pendulum varies directly as the square root of its length. If a pendulum three feet long has a period of 4.8 seconds, find the period of a pendulum half as long.

D. The Hubble Telescope can see stars and galaxies whose brightness is approximately 2% of the faintest objects observable using Earth-based telescopes. The brightness of an object varies inversely as the square of its distance from the observer. How much farther into space is the Hubble Telescope able to see compared to the Earth-based telescopes?

Vocabulary Concepts Skills

Conditional

Converse

Inverse

Negation

Contrapositive

Biconditional

Logic

Theorems

Properties

Postulates

Definitions

2.01 Use logic and deductive reasoning to draw conclusions and solve problems.

A. If Shane is an athlete and he is salaried, then Shane is a professional. Shane is not a professional. Shane is an athlete. Which statement must be true?

a) Shane is an athlete and he is salaried.
b) Shane is a professional or he is salaried.
c) Shane is not salaried.
d) Shane is not an athlete.

B. When the statement “If A, then B” is true, which statement must also be true?

(a) If B, then A.
(b) If not A, then B.
(c) If not B, then A.
(d) If not B, then not A.

C. If two triangles are congruent, then all of the corresponding parts are congruent. Write the converse; the contrapositive; the inverse.

D. If Sue goes out on Friday night and not on Saturday night, then she does not study. If Sue does not fail mathematics, then she studies. Sue does not fail mathematics. If Sue does not go out on Friday night, then she watches a movie. Sue does not watch a movie.
Prove: Sue goes out on Saturday night.

E. Which is the converse of the statement "If today is Thanksgiving, then there is no school"?

a) If there is school, then today is not Thanksgiving.
b) If there is no school, then today is Thanksgiving.
c) If today is Thanksgiving, then there is school.
d) If today is not Thanksgiving, then there is school.

F. If I receive a check for $500, then we will go on a trip. If the car breaks down, then we will not go on the trip. Either I receive a check for $500 or we will not buy souvenirs. The car breaks down.
Prove: We will not buy souvenirs.

Vocabulary
Concepts
Skills

Adjacent Angles

Vertical Angles

Linear Pair

Complementary

Supplementary

Alternate Interior

Corresponding

Same Side Interior

Transversal

Angle Addition Postulate

Midpoint

Segment Bisector

Angle Bisector

Perpendicular Bisector

Parallel

Perpendicular

Skew

Collinear

Slope

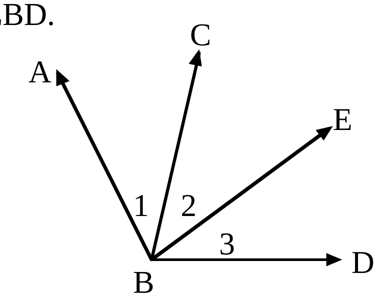
Length

Forms of Proof

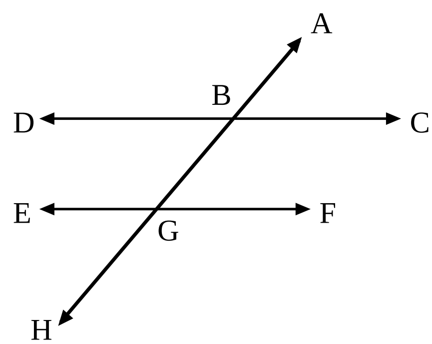
2.02 Apply properties, definitions, and theorems of angles and lines to solve problems and write proofs.

A. If SU bisects ∠RST, m∠RSU = (2x - 11), and m∠RST = (3x + 23), find m∠TSU. Use a two-column format to show your work.

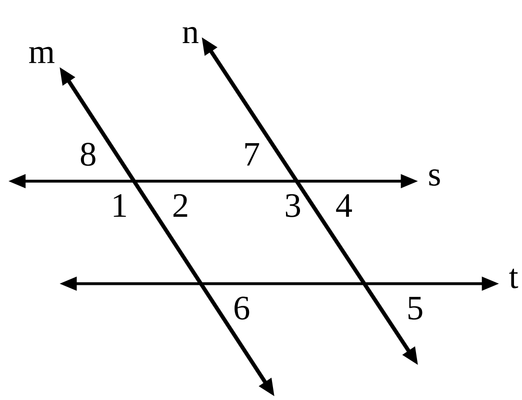
B. Write a flow diagram to illustrate the following proof.
Given ∠ABE ≅ ∠CBD, prove ∠ABC ≅ ∠EBD.



C. $\overleftrightarrow{DC}$ and $\overleftrightarrow{EF}$ are parallel, m∠EGH = (2x - 5), and m∠GBC = (3x - 10). Determine the m∠ABC. Explain your reasoning.

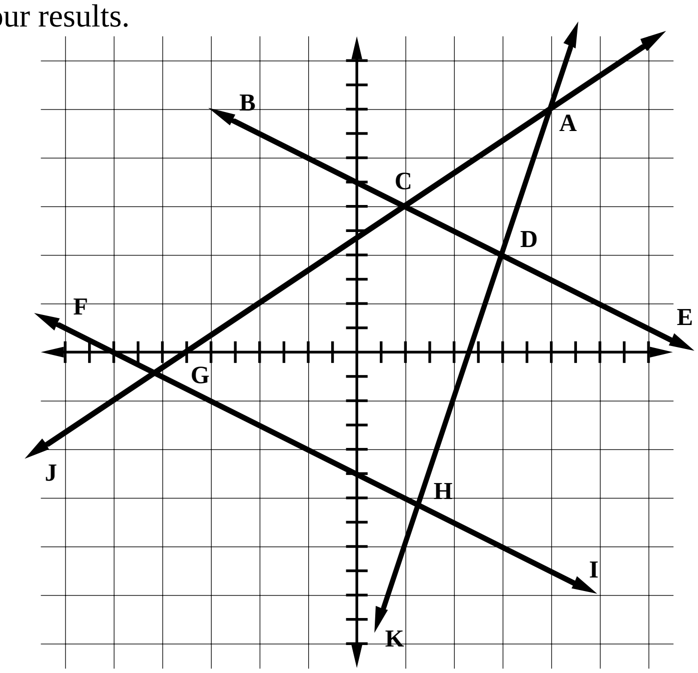


D. Given ∠1 ≅ ∠3 and ∠7 ≅ ∠6, prove $\overleftrightarrow{s}$ and $\overleftrightarrow{t}$ are parallel.

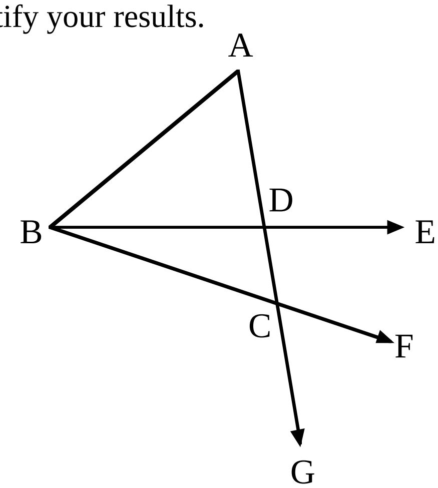


Vocabulary
Concepts
Skills

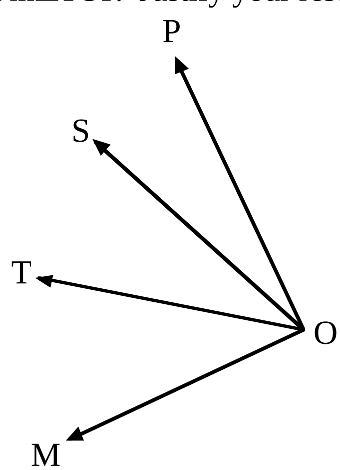
E. Find m∠FGJ, m∠KHI, and m∠CAD to the nearest hundredth. Justify your results.



F. Find m∠DBC if m∠ACB = (21x + 36), m∠FCG = (13x + 42), and m∠ADB = 83. Justify your results.



G. Given $\overrightarrow{OS}$ bisects ∠TOP, $\overrightarrow{OM} \perp \overrightarrow{OP}$, m∠MOT = (3$x$ + 3), and m∠TOS = (2x + 5), find m∠TOP. Justify your results.



Vocabulary Concepts Skills

Interior Angle

Exterior Angle

SAS

SSS

ASA

HL

AAS

CPCTC

AA

Scale Factor

Geometric Mean

Pythagorean Theorem

Opposite

Adjacent

Included

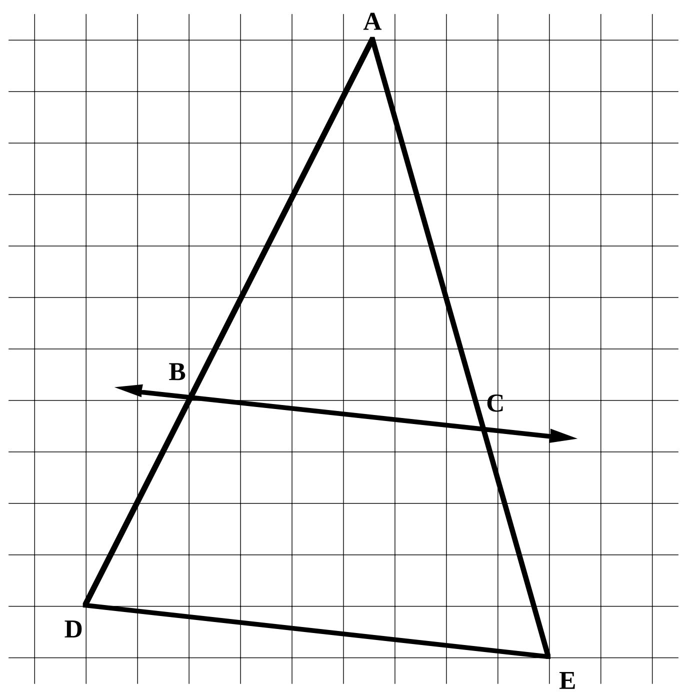
Proportional

Forms of Proof

2.03 Apply properties, definitions, and theorems of two-dimensional figures to solve problems and write proofs.

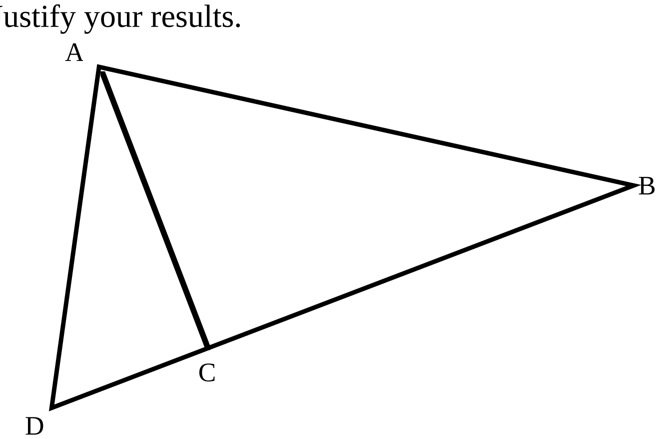
a) Triangles

A. $\overleftrightarrow{BC}$ and $\overline{DE}$ are parallel. Find the perimeters of ABC and BCED. Justify your results.



B. In ΔABC, AB = 27 and BC = 15. What is true about the length of $\overline{AC}$? Explain.

C. In ΔADB, m∠DAB = m∠ACB = 90, AB = 19, and AC = 9. Find DC. Justify your results.



Vocabulary
Concepts
Skills

Scalene

Isosceles

Equilateral

Equiangular

Right

Acute

Obtuse

Altitude

Median

Prependicular

Bisector

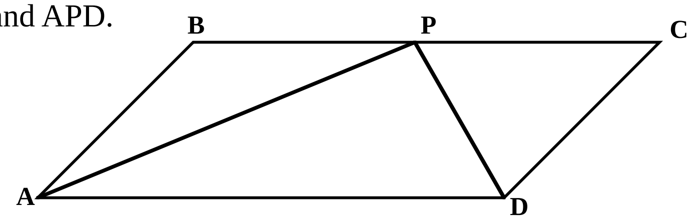
Angle Bisector

Hypotoneuse

Legs

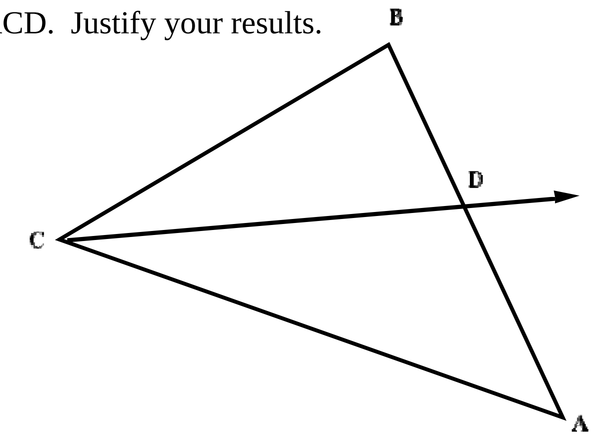
Midsegment

D. In parallelogram ABCD, the bisectors of two consecutive angles (A and D) meet at a point P on a non-adjacent side. Describe triangles ABP, PCD, and APD.

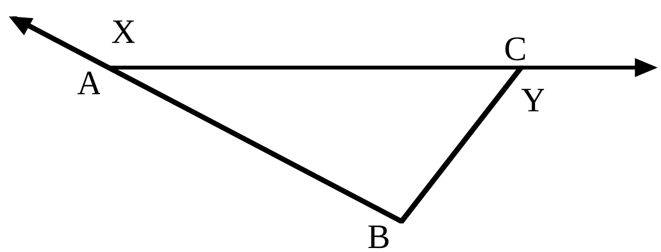


E. ΔABC is equilateral with vertices A (5, 3) and B (10, 8). Locate vertex C. Explain.

F. $\overrightarrow{CD}$ is the bisector of ∠ACB, m∠A = 46 and m∠B = 82. Find m∠ACD. Justify your results.



G. In ΔABC, $\overline{AB} \cong \overline{BC}$. If m∠Y = 112, what is the measure of ∠X? Justify your results.



H. In ΔSAT, m∠S = (2*x* - 10), m∠A = (*x* + 15), and m∠T = (4*x* - 20). Describe ΔSAT.

I. The sides of ΔPQT are 17.6, 11.7, and 9.6 meters. Find the perimeter of the triangle formed by connecting the midpoints of the sides of ΔPQT. Justify your results.

Vocabulary Concepts Skills

Rectangle

Parallelogram

Square

Rhombus

Kite

Trapezoid

Isosceles Trapezoid

Diagonals

Consecutive Angles

Opposite Angles

Opposite Sides

Slope

Parallel

Perpendicular

Congruent

Similar

Base

Height

Midsegment

2.03 Apply properties, definitions, and theorems of two-dimensional figures to solve problems and write proofs.

b) Quadrilaterals

A. The vertices of ABCD are A(-5, 1), B(3, 6), C(7, 0), and D(-1, -5). What si the best name for the figure? Justify your answer.

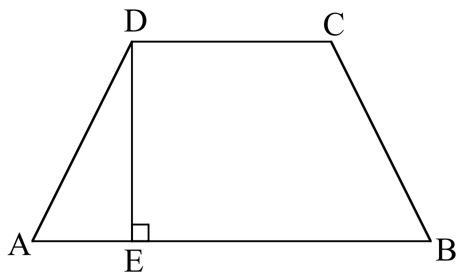
B. Find the length of the midsegment of the trapezoid with vertices (-3, -2), (-2, 1), (4, 5), and (1, -4). Is the trapezoid isosceles? Justify.

C. For parallelogram ABCD, m∠A = (8x - 16) and the measure of the exterior angle at C is (5x + 18). Find m∠B; justify.

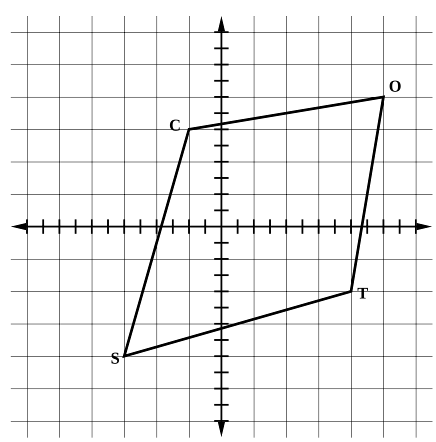
D. In parallelogram BCDF with A(3, -1) and D(-1, 5), find the coordinates of the point of intersection of the diagonals. Explain.

E. A parallelogram has vertices (-4, 5), (-1, -4), and (6, 4). What are the ordered pairs that can be the fourth vertex? Justify each.

F. In the diagram of isosceles trapezoid ABCD, m∠A = 53, DE = 6, and DC = 10. Find the perimeter of ABCD to the nearest tenth. Justify your results.



G. Which quadrilateral is TOCS? Justify.



Vocabulary Concepts Skills

Interior Angle

Exterior Angle

Regular

irregular

Composite

Convex

Concave

Equilateral

Equiangular

Diagonal

Apothem

Inscribed

Circumscribed

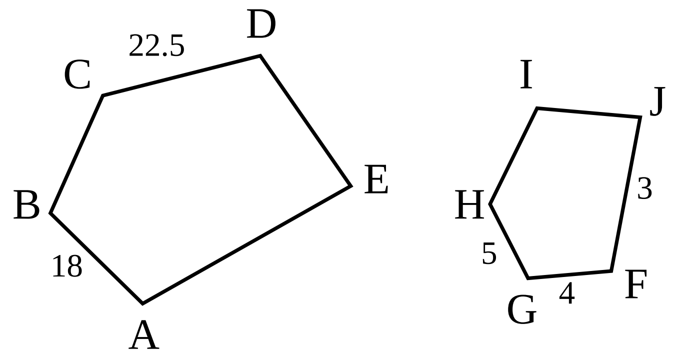
3-10, 12-gons

DRAFT

2.03 Apply properties, definitions, and theorems of two-dimensional figures to solve problems and write proofs.
c) Other Polygons

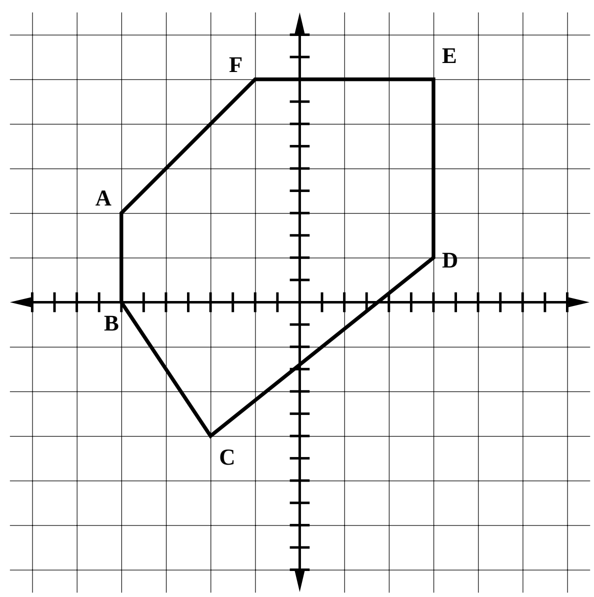
A. The measure of an exterior angle of a regular polygon is 20°. Find the number of sides of the polygon. Explain.

B. ABCDE ~ FGHIJ. Find the perimeter of each figure. Explain.



C. In convex pentagon ABCDE m∠A = 6*x*, m∠B = (4*x* + 13), m∠C = (*x* + 9), m∠D = (2*x* - 8), and m∠E = (4*x* - 1). What are the measures of all the angles? Justify your results.

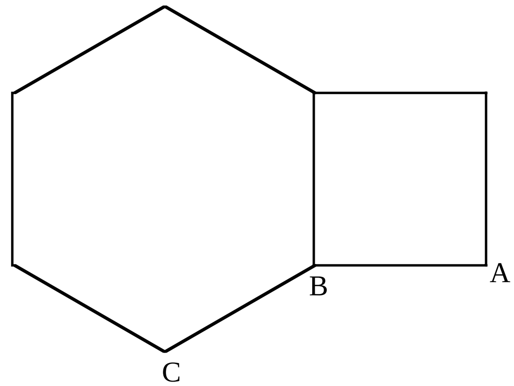
D. Find the measures of all the exterior angles of ABCDEF. Justify your results.



Vocabulary Concepts Skills

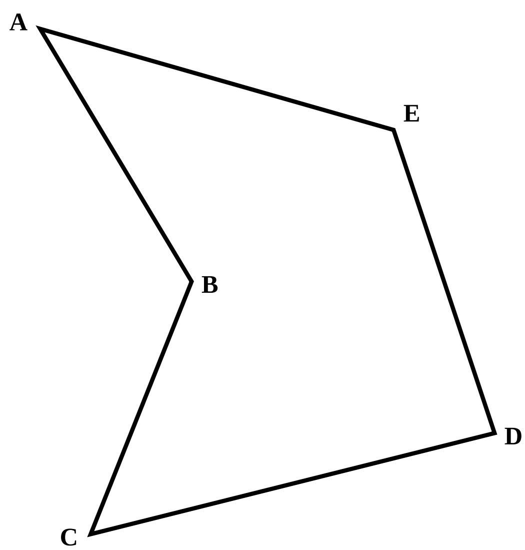
E. Find the apothem of a regular hexagon with sides of length 7.6 cm. Explain.

F. Point B is a mutual vertex of a regular hexagon, a square, and a third regular polygon as shown below. If two of the sides of this third polygon are $\overline{AB}$ and $\overline{BC}$, what is this polygon? Justify.

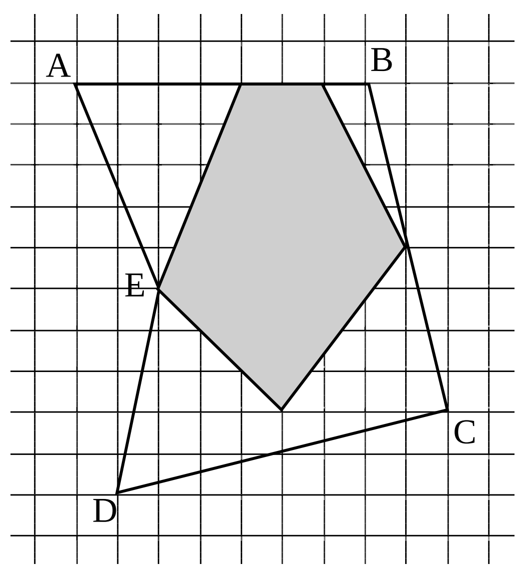


G. ABCDEF is a convex figure where ∠A ≅ ∠D, ∠B ≅ ∠C ≅ ∠E ≅ ∠F, and the measure of the exterior angle at E is 8°. What are the measures of all the interior angles?

H. Relocate vertex B so that ABCDE is convex and all sides remain the same length. Explain.



I. What is the chance of hitting the unshaded interior of ABCDE?



Vocabulary Concepts Skills

Radius

Diameter

Circumference

π

Chord

Tangent

Secant

Circumscribed

Inscribed

Concentric

Major Arc

Minor Arc

Sector

Semicircle

Inscribed Angle

Central Angle

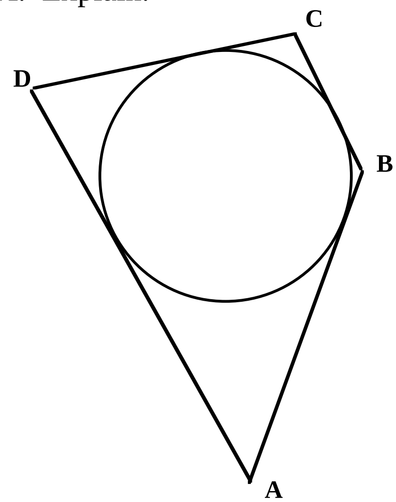
Internally Tangent

Externally Tangent

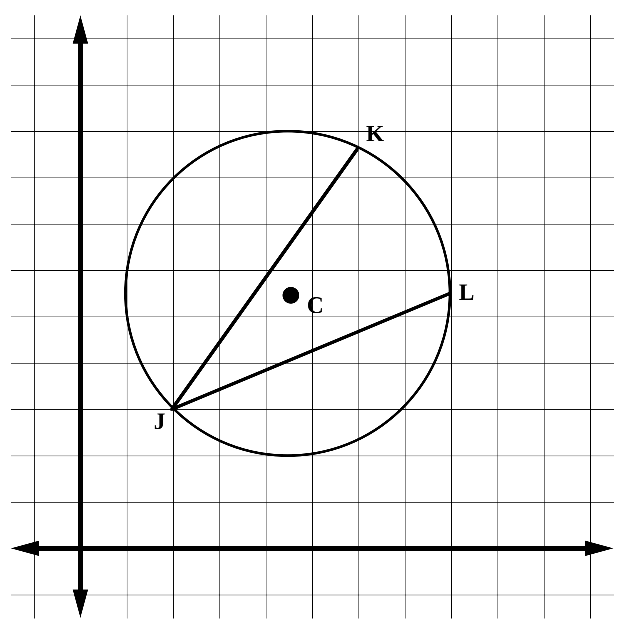
2.03 Apply properties, definitions, and theorems of two-dimensional figures to solve problems and write proofs.

d) Circles

A. $\overline{AB}$, $\overline{BC}$, $\overline{CD}$, and $\overline{DA}$ are tangent to the circle, AB = 14, BC = 12, and CD = 16. Find DA. Explain.

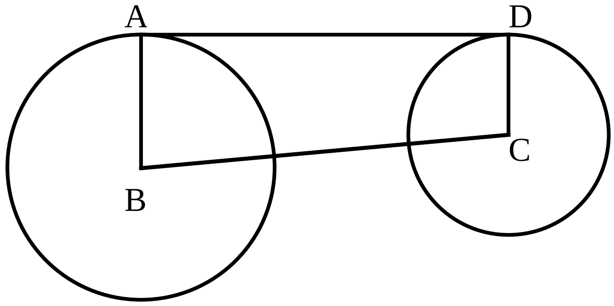


B. Given circle C, find the length of $\overset{\frown}{KL}$ and m$\angle$KJL. Justify your results.

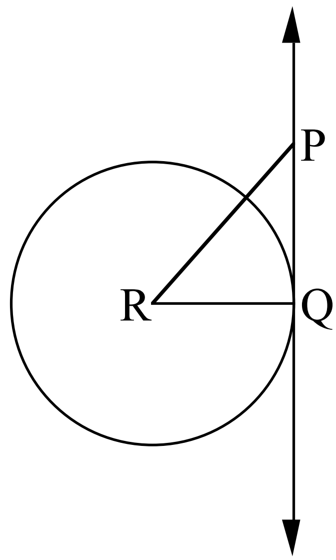


Vocabulary
Concepts
Skills

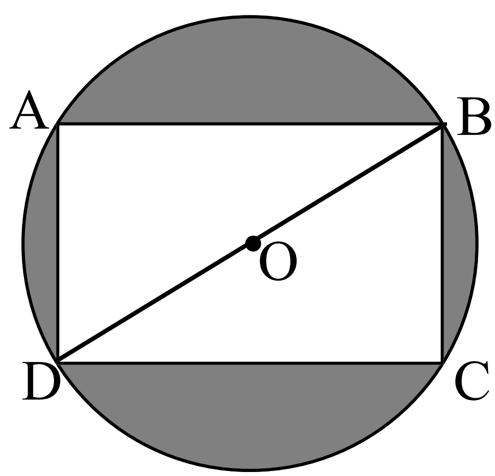
C. The radius of circle B is 38, the radius of circle C is 24 and AD = 91. Find BC. Explain.



D. $\overleftrightarrow{PQ}$ is a tangent to circle R at point Q. The circle has a radius of 19. If m∠R = 50, find RP. Justify your results.



E. In the diagram, ABCD is a rectangle inscribed in the circle O. The ratio AB to BC is 7:3. The area of the rectangle is 165 cm^2. Find the area of the shaded portion.



Vocabulary
Concepts
Skills

2.04 Use the laws of sines and cosines to solve problems.

Vocabulary Concepts Skills

Graph

Intersection

Substitution

Matrix Equation

Linear

Quadratic

Cubic

Exponential

Rational

Radical

Absolute Value

Circle

3.01 Use systems of two or more equations or inequalities to model and solve problems; justify results. Solve using tables, graphs, matrix operations, and algebraic properties.

A. For the period 1970-1998 ($x = 0$ for 1970), $f(x) = 0.71x^2 + 2.15x + 67.53$ models US exports and $g(x) = 0.82x^2 + 6.42x + 55.07$ models US imports. Find the years when US trade was balanced, $f(x) = g(x)$. Graphically identify and algebraically define the US trade surplus/deficit, according to the functions provided.

B. A luxury car's value is represented by the equation $y_1 = 50(0.822)^x$. A sports utility vehicle's (SUV) value is represented by the equation $y_2 = 30(0.884)^x$. In both functions, y is the value ($1000's) of the automobile after x years. Assuming one of each model is purchased on the same day, how long before the luxury car is only worth $1000 more than the SUV? How long until the two automobiles are equal in value? How long before the SUV is worth $1000 more than the luxury car?

C. Write the system of inequalities that describes a triangular region with one vertex at (7, 5) and another on the x-axis. None of the sides can be horizontal or vertical.

D. Find the solution for the system:

$$6x - 3y + 19z = 23$$
$$-5x + 11y - 5z = -14$$
$$x + 7y + 4z = 6$$

E. Find the solution for the system:

$$-w + 2.4x + 4.5y - 7.1z = 19$$
$$3w + 7.7x - 5.8y + 2z = 0$$
$$1.3w - 4.3x + 9.2y - z = 23.4$$
$$-5.3w + 6.6x + 1.6y + 7.9z = 4.4$$

F. Write a system of inequalities that defines a parallelogram in the second quadrant with one vertex at (-3, 4). The sides cannot be vertical or horizontal.

Vocabulary Concepts Skills

Graph

Factor

Completing the Square

Quadratic Formula

Set Notation

Number Line

Maximum

Minimum

Increasing

Decreasing

Domain

Range

Independent

Dependent

Parabola

$f(x) = \mathrm{a}x^2 + \mathrm{b}x + \mathrm{c}$

$y - \mathrm{k} = \mathrm{a}(x - \mathrm{h})^2$

3.02 Use quadratic functions to model and solve problems; justify results.

A. Name the vertex and all the intercepts of $f(x) = x^2 - 4x + 3$. Justify the results algebraically.

B. Name the vertex and all the intercepts of $f(x) = 3x^2 - 4x + 5$. Justify the results algebraically.

C. What is a quadratic function that has roots $(5 + 2i)$ and $(5 - 2i)$?

D. The function $f(x) = -0.019x^2 + 3.04x - 58.87$ describes newspaper circulation (millions) in the United States for 1920-98 ($x = 20$ for 1920). Identify periods of increasing and decreasing circulation. According to the function, when did newspaper circulation peak? When will circulation approximate 45 million?

E. From the top of a 56 foot tower, a projectile is launched straight up and reaches a maximum height of 120 feet after two seconds. What is the equation of the height function $h(t)$ in terms of time t?
Use the form $h(t) = \mathrm{a}(t - \mathrm{b})^2 + \mathrm{c}$. Explain the coefficient **a**. When will the projectile hit the ground? During what interval was the projectile at a height of at least 96 feet?

F. The space shuttle uses solid rocket boosters (SRB) during the launch phase of its flight from Cape Canaveral. The SRBs burn for about two minutes, shut down, detach from the main rocket assembly, and fall back to Earth 140 miles downrange. Parachutes assist the ocean landing, beginning at an altitude of 20,000 feet. The SRBs are recovered and used again for a later launch. The function $f(x) = -33 + 0.72x – 0.00176x^2$, for $x \geq 115.5$, describes the altitude of the shuttle's SRBs since the launch (x is elapsed time in seconds). How long after launch do the SRBs splashdown? The SRBs separate from the shuttle after 115.5 seconds. How much longer do the SRBs continue to gain altitude?

G. For $f(x) = 2x^2 - 17x + 26$, locate the vertex and intercepts. Justify the results algebraically.

H. Solve $3x^2 - 5 = 7x$. Justify the results algebraically.

Vocabulary Concepts Skills

Coefficients

Vertex

Intercepts

Solutions

Roots

Zeros

Properties of Equality

I. The height of a baseball, just hit, is approximated by $h(x) = -0.0011x^2 + 0.4545x + 3$ where x is the horizontal distance from homeplate. The ball is approaching the ten-foot outfield wall, 400 feet from homeplate. If the ball is not caught, will it go over the wall?

J. Each orange tree in a California grove produces 600 oranges per year if no more than 20 trees are planted per acre. For each additional tree planted per acre, the yield per tree decreases by 15 oranges. How many trees per acre should be planted to obtain the greatest number of oranges?

Vocabulary Concepts Skills

Graph

Increasing

Decreasing

Domain

Range

Asymptotes

Discontinuity

Factor

Common Denominator

Properties of Equality

Extraneous Roots

Intercepts

Solutions

Set Notation

3.03 Use rational functions to model and solve problems; justify results.

A. Graph $f(x) = \frac{2}{x+5}$. Identify intercepts and any vertical and horizontal asymptotes. State the domain and range of the function.

B. Graph $f(x) = \frac{x-3}{x^2-2x-15}$. Identify intercepts and any vertical and horizontal asymptotes. State the domain and range of the function.

C. Graph $f(x) = \frac{x^3+x^2}{x^2+2x-8}$. Identify intercepts and any vertical and horizontal asymptotes. State the domain and range of the function.

D. Explain how $f(x) = \frac{x^2-9}{x-3}$ and $g(x) = x + 3$ are similar and different. Include the graphs and a comparison of the functions' asymptotes, intercepts, and domain.

E. Solve $\frac{x+6}{2x+6} = \frac{3x-2}{2x+1}$ algebraically; justify steps used. Identify the solution(s) graphically.

F. The function $d(x) = \frac{8710x^2 - 69400x + 470000}{1.08x^2 - 324x + 82200}$ can be used to accurately model the braking distance (feet) for cars traveling between 20 and 70 miles per hour. If a car doubles its speed, how does the stopping distance change? (double? triple?) If it takes a car 340 feet to stop safely, how fast was the car traveling?

G. When you eat sugary foods, the amount of acid in your mouth temporarily increases. This causes your mouth's pH level to decrease. The pH level t minutes after eating can be approximated by the function $P(t) = \frac{65t^2 - 204t + 2340}{10t^2 + 360}$. Tooth decay can occur if the pH level in your mouth falls too low and remains low for a period of time. How long after sugary foods are eaten is the lowest pH level reached? What is the lowest pH level? As time passes, what value does the pH level approach?

Vocabulary Concepts Skills

H. A truck traveling at constant speed on a reasonably straight, level road burns fuel at the rate of $g(x)$ gallons per mile, where x is the speed of the truck (miles per hour) and $g(x) = \frac{800 + x^2}{200x}$. If fuel costs $1.40 per gallon, find the cost function, $c(x)$, that expresses the amount of fuel needed for a 500-mile trip as a function of speed. What driving speeds will make the cost of the fuel for the trip less than $250? What driving speed will minimize the cost of fuel for the trip?

I. The function that describes gravitational acceleration ($\frac{\text{meters}}{\text{second}^2}$) of an object relative to the Earth is $g(r) = \frac{3.987 \bullet 10^{14}}{(6.378 \bullet 10^6 + r)^2}$ where r is the distance in meters above the earth's surface. Use the graph of $g(r)$ to explain if it is possible to escape Earth's gravity.

J. The expected population of bears, $P(t)$, in a national park for the next 100 years (t) is modeled by $P(t) = \frac{500 + 250t}{10 + 0.5t}$. What is the initial bear population? Find the population after 10, 40, and 100 years. If the bear population continues to grow according to projections, what is the maximum expected population?

K. One simple plan for a state income tax requires those persons with incomes of $10,000 or less to pay no tax and those persons with incomes greater than $10,000 to pay a tax of 8% only on the amount over $10,000. Algebraically, what does this tax plan look like?
A person's effective tax rate is defined as the percent of total income that is paid in tax. Based on this definition and the plan outline, could any person's effective tax be 7%? Explain your answer. Include an example to justify your conclusion. Algebraically, what does this effective tax rate look like?
Based on this definition and the plan outline, could any person's effective tax be 8%? Explain your answer. Include an example to justify your conclusion.

Vocabulary
Concepts
Skills

Graph

Factor

Maximum

Minimum

Increasing

Decreasing

Domain

Range

Independent

Dependent

Transformations

Coefficients

Intercepts

Properties of Equality

Set Notation

Number Line

Solutions

Zeros

$f(x) = |ax + b|$

3.04 Use equations and inequalities with absolute value to model and solve problems; justify results.

A. A fast-moving cold front in the Northeast can cause temperatures to drop very quickly then rise again. The following data uses *t* as the hours since midnight on a day the cold front moves in, and *T* as the temperature in degrees Fahrenheit.

t	0	1	2	3	4	5	6	7	8	9	10
T	3	1	–1	–3	–5	–7	–5	–3	–1	1	3

The absolute value function has a similar shape. Use a transformation of $f(x) = |x|$ to model this data.

B.. What plane figure is described by $y \geq |2x - 3|$ and $y \leq 6 - |2x - 3|$?

C. Given $y \geq |2x - 3|$, find another equation of the form $y \leq |ax + b|$ so that a system of inequalities exist that describes a kite with one vertex at (0, 3).

D. Solve $|3x - 4| \leq 17$ for x. Justify each step.

E. Solve $|16 – 3x| = |x| + 3$ for x.

3.05 Transform functions in two dimensions; describe the results algebraically and geometrically.

Vocabulary Concepts Skills

Graph

Maximum

Minimum

Increasing

Decreasing

Domain

Range

Independent

Dependent

Parabola

$f(x) = \mathrm{a}x^2 + \mathrm{b}x + \mathrm{c}$

$y - \mathrm{k} = \mathrm{a}(x - \mathrm{h})^2$

$f(x) = |\mathrm{a}x + \mathrm{b}|$

A. For $f(x) = 2x^2 + \mathrm{b}x + 10$: As **b** increases/decreases, how does the graph of $f(x)$ change?

B. For $f(x) = \mathrm{a}x^2 - 2x + 5$: As **a** gets close to zero, how does the graph of $f(x)$ change?

C. Compare $f(x) = \mathrm{a}x^2 + \mathrm{b}x + \mathrm{c}$ and $g(x) = -\mathrm{a}x^2 + \mathrm{b}x + \mathrm{c}$. Identify similarities and differences.

D. For $f(x) = 2.5x^2 + 17x + \mathrm{c}$: As **c** increases/decreases, how does the graph of $f(x)$ change?

E. Consider the graph of $y = |\mathrm{a}x + 5|$ when $\mathrm{a} \geq 2$. As **a** increases, how does the graph change? What happens to the vertex of $y = |\mathrm{a}x + 5|$?

F. Consider the graph of $y = |2x + \mathrm{b}|$ when $\mathrm{b} \geq 0$. As **b** increases, how does the graph change?

G. Consider $f(x) = \dfrac{a}{x+b}$. As the value of a increases/decreases, how does the graph of $f(x)$ change? As b increases/decreases, how does the graph of $f(x)$ change?

H. Consider $g(x) = h + \dfrac{1}{(x+k)^2}$. As h increases/decreases, how does the graph of $g(x)$ change? As k increases/decreases, how does the graph of $g(x)$ change?