

1. Algebraic Fractions with Factoring

March 2000

1. Reduce to lowest terms. Leave no ()s in answer. $\frac{12x^2 - x - 20}{12x^4 - 25x^3 + 12x^2}$

Ans. _____

2. Rewrite as a single fraction in simplest form. Leave the denominator in factored form.

$$\frac{1}{x^2 - 3x + 2} + \frac{1}{x^2 - 5x + 6} + \frac{1}{x^3 - x^2 - 4x + 4}$$

Ans. _____

3. Find all value(s) of x such that $\frac{\frac{1}{x-3} + \frac{1}{x-2}}{1 - \frac{2x-9}{x^2-5x+6}} = \frac{7}{9}$

Ans. _____

1. Algebraic Fractions with Factoring

March 2001

1. Simplify completely: $\frac{x^2 + 6x + 9}{x^2 + 5x + 6} \cdot \frac{x^2 - 2x - 8}{x^2 - 5x + 4} \cdot (1 - x)$

Ans. _____

2. Factor into a product of two binomials: $128xz - 72yz - 48x^2 + 27xy$

Ans. _____

3. Solve for x : $\frac{x-3}{x-2} + \frac{x-5}{4-x} = \frac{x^2-2x-8}{x^2-6x+8}$

Ans. _____

1. Algebraic Fractions with Factoring

March 2002

1. Simplify the following and express in lowest terms: $\frac{a-b}{a} + \frac{a+b}{a-b} - \frac{a+b}{b} - \frac{a-b}{a+b}$

Ans. _____

2. Find all values of x such that $\frac{1}{3-x} + \frac{5}{x+1} = \frac{8}{x^2-2x-3}$

Ans. _____

3. Solve for x , if $\frac{x-3}{x-1} - \frac{x+1}{x+2} = \frac{x-5}{x-2}$

Ans. _____

1. Algebraic Fractions with Factoring

March 2003

1. Express in simplest form: $\frac{x+x^2+x^3+x^4+x^5+x^6+x^7}{x^3+x^4+x^5+x^6+x^7+x^8+x^9}$

Ans. _____

2. Find N so that $\frac{N}{x-5} + \frac{3}{x+4} = \frac{10x+13}{x^2-x-20}$

Ans. _____

3. Find all values of x that satisfy the equation:

$$\frac{6}{\sqrt{x-8}-9} + \frac{1}{\sqrt{x-8}-4} + \frac{7}{\sqrt{x-8}+4} + \frac{12}{\sqrt{x-8}+9} = 0$$

Ans. _____

1. Algebraic Fractions with Factoring

March 2004

1. Simplify $\frac{x}{x^2 + 5x + 6} + \frac{4}{x^2 + 2x}$

Ans. _____

2. Mark can paint a side of a certain house in 3 fewer hours than Todd can paint the same surface. If they work together, it takes them 6 hrs. 40 min. At the same rate, how long does it take Todd to do the job alone?

Ans. _____

3. Find the value(s) of x for which $\frac{1}{x - x^3} = \frac{1}{x} + \frac{2}{x - 1}$.

Ans. _____

1. Algebraic Fractions with Factoring

March 2005

1. Simplify $\frac{(x + 2)(2x + 1)}{(x - 1)(2x + 1)} + \frac{(x + 3)(x - 1)}{(2x + 1)(x - 1)} - \frac{x^2 + 4x + 4}{(2x + 1)(x - 1)}$

Ans. _____

2. Simplify <there was no problem here ...>

Ans. _____

3. Solve for x . $\frac{x - 1}{(2x + 3)(x - 2)} - \frac{2x - 6}{(2x - 3)(x - 1)} = \frac{3x - 11}{(x - 2)(x - 1)}$

Ans. _____

1. Algebraic Fractions with Factoring

March 2006

1. Simplify: $\frac{6x-18}{5x-10} \div \frac{2x+4}{3x-6} \cdot \frac{7x+14}{9x-27}$

Ans. _____

2. Alex takes 3 hours longer to complete a certain job than Barry does. If they can complete the job by working together in 3.6 hours, how long would it take Alex to complete the job working alone?

Ans. _____

3. Find the value(s) of x , such that $\frac{-5x}{1-x} - \frac{2}{x+3} = \frac{8}{x^2+2x-3}$

Ans. _____

1. Algebraic Fractions with Factoring

March 2007 (No Calculators)

1. Solve the following equation: $\frac{3}{y-3} = \frac{6}{y^2-9}$

Ans. _____

2. Find the values of C and D , if $\frac{C}{x-2} + \frac{D}{x+1} = \frac{6x}{x^2-x-2}$ is an identity.

Ans. _____

3. Simplify. Assume no denominator equals zero.

$$\frac{x^3 + 5x^2 + 6x}{4 - y - 4x} \cdot \frac{16x^2 + 8y - y^2 - 16}{x^2(x+2) - x(x+2) - 12(x+2)}$$

Ans. _____

1. Algebraic Fractions with Factoring

March 2008 (No Calculators)

1. Solve for x , if $\frac{1}{x} + \frac{3}{x} = x$.

Ans. _____

2. Find all value(s) of x such that $\frac{x-20}{x} + \frac{x}{72} = \frac{3}{2}$.

Ans. _____

3. Find all real value(s) of x which satisfy the equation:

$$\frac{x}{x^2 - 3x + 2} - \frac{x-1}{x+1} = \frac{x^2 - 5x + 5}{x^2 - 1}$$

Ans. _____

1. Algebraic Fractions with Factoring

March 2009 (No Calculators)

1. Find all value(s) of x such that: $\frac{x+3}{x-1} + \frac{x+5}{x+1} = \frac{x^2 + 3x - 8}{x^2 - 1}$.

Ans. _____

2. Find the coefficient of x^{29} in the polynomial quotient of $\frac{x^{53} + 1}{x + 1}$.

Ans. _____

3. Simplify: $\frac{4x^4 - 17x^2 + 4}{2x^2 + 3x - 2} + 2$. Assume no denominator = 0.

Ans. _____

2. Trigonometric Equations and Identities

March 2001

1. If $0^\circ \leq \theta < 360^\circ$, for how many values of θ is the equation $5 \sin^2 \theta + \sin \theta - 4 = 0$ is true?

Ans. _____

2. Express $\frac{\sec x + \tan x}{\sin x}(1 - \sin x)$ as a single trigonometric function without a denominator.

Ans. _____

3. If $\sin 4x = A \sin x \cos x + B \sin^3 x \cos x$ for all values of x , find $A + B$.

Ans. _____

2. Trigonometric Equations and Identities

March 2002

1. Express $\sin^2 x + \cos^2 x + \tan^2 x + \sec^2 x$ as a single trig function in simplest form.

Ans. _____

2. Find all values θ for which $\cos^2 \theta - \sin \theta \cos \theta = 0$, if $0^\circ \leq \theta < 360^\circ$.

Ans. _____

3. Find all value(s) of x such that $\sec^2 x + 3 \csc^2 x = 8$, where $0 \leq x < 2\pi$.

Ans. _____

2. Trigonometric Equations and Identities

March 2003

1. Solve for x , where $0^\circ \leq x \leq 180^\circ$, and $\sin x \cos x \tan x \sec x \csc x = 1$.

Ans. _____

2. Evaluate: $\cos \frac{5\pi}{12} \cos \frac{\pi}{12} + \sin \frac{5\pi}{12} \sin \frac{\pi}{12}$. Express your answer as a fraction in simplest form.

Ans. _____

3. Find all values of x , where $0^\circ \leq x \leq 360^\circ$, if $\sin x + \cos x = \frac{\sqrt{2}}{2}$

Ans. _____

2. Trigonometric Equations and Identities

March 2004

1. Find all x , where $-360^\circ \leq x \leq 360^\circ$, such that $\cos x = \frac{1}{2}$.

Ans. _____

2. If $\cos \frac{\pi}{8} = n$ and $\sin \frac{\pi}{8} = m$, find the product of $m \cdot n$ in simplest radical form.

Ans. _____

3. Find all value(s) of x either in degrees or radians where $0^\circ \leq x \leq 180^\circ$ or $0 \leq x \leq \pi$, if $2 \cos 2x \cos x - 8 \sin x \cos \frac{1}{2} x \cos x \sin \frac{1}{2} x + 1 = 0$

Ans. _____

2. Trigonometric Equations and Identities

March 2005 (No Calculators)

1. Find θ if $0^\circ \leq \theta \leq 360^\circ$ and $\sec \theta = \csc \theta$.

Ans. _____

2. How many solutions to the equation $2 \cos^2 \phi + 3 \cos \phi + 1 = 0$ exist in the interval $-360^\circ \leq \phi \leq 360^\circ$?

Ans. _____

3. Express $\frac{(\cos 2\theta)(\tan^2 \theta + 1)(\sin 2\theta) + 2 \tan \theta}{\cos \theta}$ in terms of only $\sin \theta$ in simplest form. *<this problem needs verification>*

Ans. _____

2. Trigonometric Equations and Identities

March 2006 (No Calculators)

1. Find all values of θ , where $-180^\circ \leq \theta \leq 180^\circ$ and $\sqrt{3} \sec \theta - 2 = 0$.

Ans. _____

2. Express the following only in terms of $\sin \phi$ in simplest form: $\frac{\sec \phi \sin \phi}{\tan \phi + \cot \phi}$

Ans. _____

3. Find all values of θ for which $-180^\circ \leq \theta \leq 180^\circ$ and $2 \sin \theta - 2 \cos \theta = 1 - 2 \sin 2\theta$.

Ans. _____

2. Trigonometric Equations and Identities

March 2007 (No Calculators)

1. Simplify, reducing the expression to a real number or to an expression involving exactly one of the six trig functions.

$$\frac{1}{\sec x}(\tan x + \cot x)$$

Ans. _____

2. Solve for θ : $\cos^4 2\theta - \sin^2 2\theta = 1$

Ans. _____

3. Find $\tan 105^\circ$. Give an exact answer in simplest form.

Ans. _____

2. Trigonometric Equations and Identities

March 2008 (No Calculators)

1. Solve for x , where $0 \leq x \leq 2\pi$ and $3 \sin x = -1.5$.

Ans. _____

2. If $\cos x = .8$ and $0^\circ \leq x \leq 90^\circ$, find the value of $\cos 2x + \sin 2x$.

Ans. _____

3. Find all value(s) of x such that $\sin \frac{1}{2}x - \cos x = 0$ and $0^\circ \leq x < 360^\circ$

Ans. _____

2. Trigonometric Equations and Identities

March 2009 (No Calculators)

1. Simplify: $\sin 2\theta - (\sin \theta + \cos \theta)^2$.

Ans. _____

2. If $0^\circ \leq \theta < 90^\circ$ and $\cos \theta = a$, find $\tan \theta$ in terms of a .

Ans. _____

3. Meter sticks (each of length 1 meter) are laid out on a flat surface to make regular polygons with varying numbers of sides. Using cosecant (csc) and no other trigonometric function, give the exact diameter in meters of the circumscribed circle of the polygon with n sides. You may use either degree or radian measure.

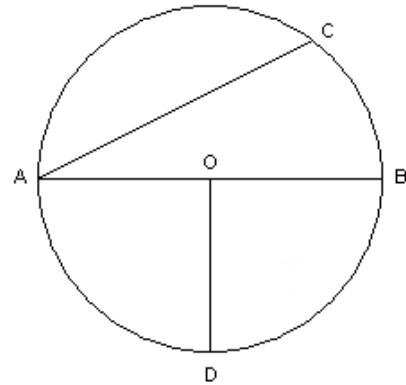
Ans. _____

3. *Circles and Spheres*

March 2000

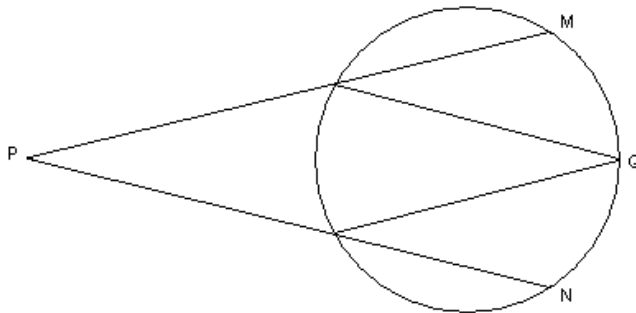
1. $m\angle BAC = 15^\circ$. Diameter AB with center O is 6 cm long. $\overline{DO} \perp \overline{AB}$. Find the length of arc CAD .

Ans. _____



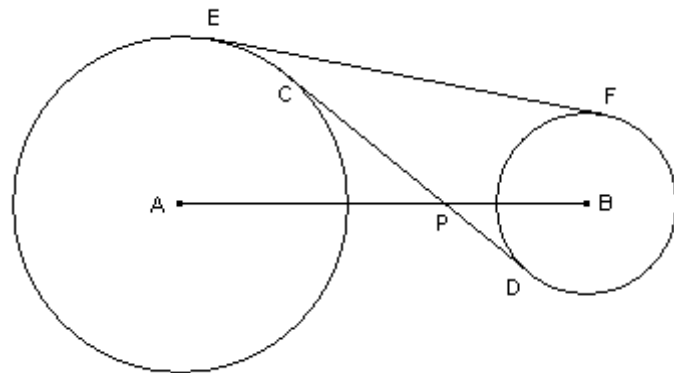
2. If $m\text{Arc}MQ = 44$, $m\text{Arc}QN = 36$, find the sum of the measures of $\angle P$ and $\angle Q$.

Ans. _____



3. \overline{CD} is internally tangent to both circles. \overline{EF} is externally tangent to both circles. A and B are the centers of the circles. If $AP = 25$, $PB = 10$ and $CD = 28$, find the exact length of \overline{EF} in simplest form or rounded to the nearest hundredth.

Ans. _____

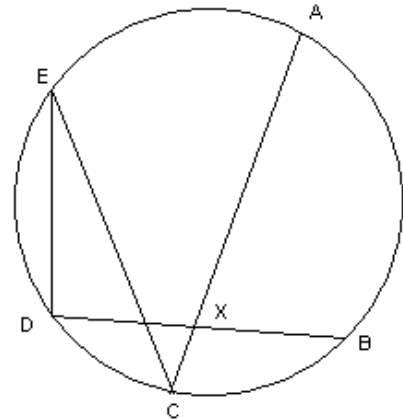


3. *Circles and Spheres*

March 2001

1. Given:
 $m\text{Arc}AB = 110^\circ$ and $m\angle AXB = 80^\circ$, find $m\angle DEC$.
 Express your answer in degrees.

Ans. _____



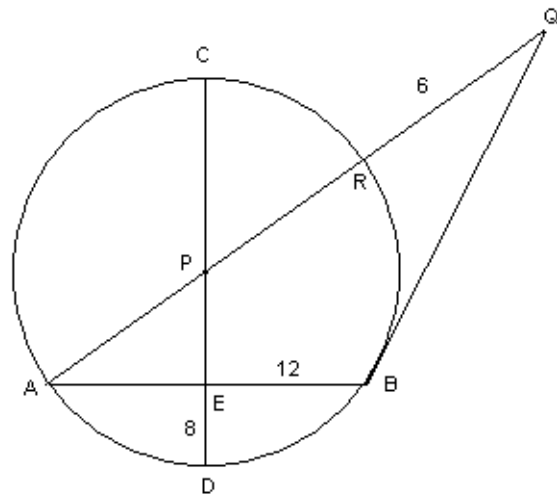
2. A 6" radius spherical bowling ball has a hollow, concentric interior with radius of 2". Inside the interior is a spherical marble with radius $3/8$ ". As the bowling ball rolls, the marble also rolls so that it is always at the bottom of the interior. How many revolutions does the marble make while the bowling ball makes 60 revolutions?

Ans. _____

3. Given: Center P, $\overline{CD} \perp \overline{AB}$,
 \overline{QB} is tangent at B,
 $DE = 8$, $BE = 12$,
 $QR = 6$.

Find BQ . Express in simplest radical form.

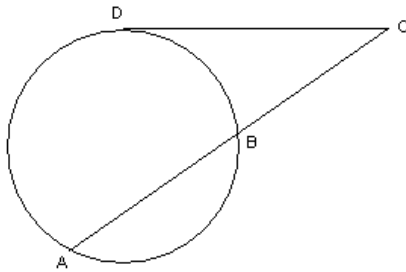
Ans. _____



3. *Circles and Spheres*

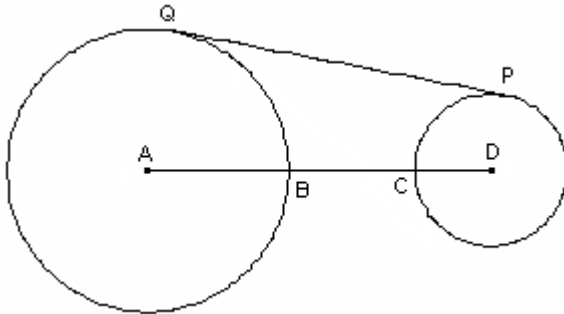
March 2002

1. Find the length of the tangent segment CD , if $AB = 7$ and $BC = 9$.



Ans. _____

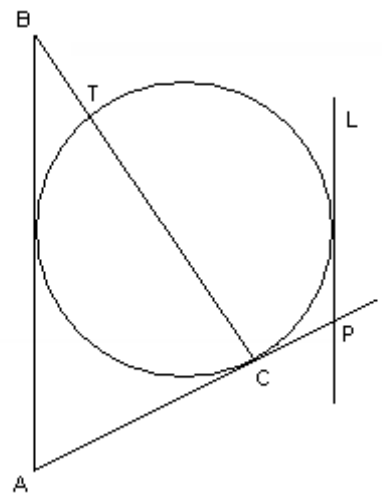
2. A and D are centers. $AB = 12$, $BC = 8$ and $CD = 5$. Find the length of tangent \overline{PQ} .



Ans. _____

3. The circle at right is tangent to the two parallel lines \overline{AB} and \overline{PL} . \overline{AP} is tangent to the circle at C . $\overline{BC} \perp \overline{AP}$. If $AC = 15$, $BC = 20$, and $AB = 25$. Find the length of segment \overline{BT} .

Ans. _____



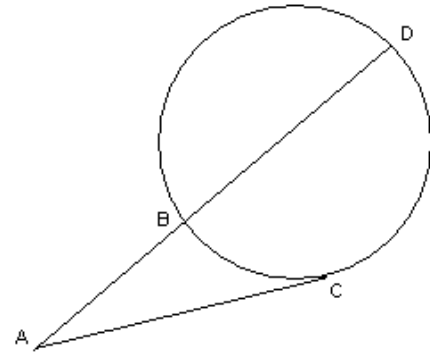
3. *Circles and Spheres*

March 2003

1. Given: $m\text{Arc}BC = 68^\circ$, tangent segment AC ,
 $m\text{Arc}CD = m\text{Arc}BD$

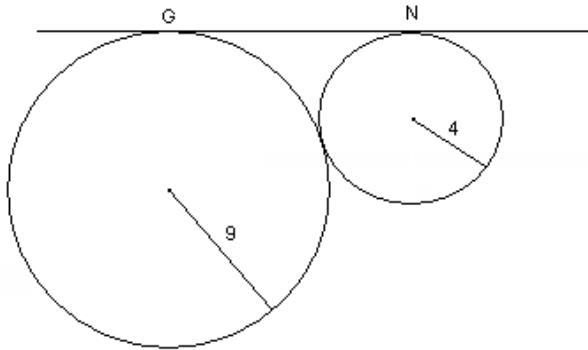
Find $m\angle A$.

Ans. _____



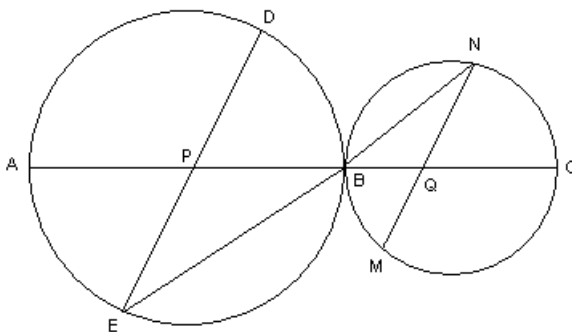
2. Circles P and L are tangent and have radii of 9 and 4 respectively. Find the length of the common tangent GN .

Ans. _____



3. The tangent circles meet at B . $AB = 32$, $BC = 24$, $PD = QN = 12$, $PE = 16$, $AP > PB$, and $\overline{DE} \parallel \overline{MN}$. Find the length of segment MQ .

Ans. _____



3. *Circles and Spheres*

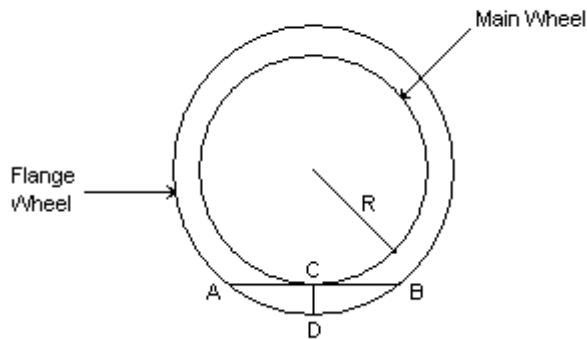
March 2004

1. A regular hexagon is inscribed in a circle. The radius of the circle is 3 cm. Find the cm. measure of the length of the arc between two consecutive vertices of the hexagon. Express your answer in terms of π .

Ans. _____

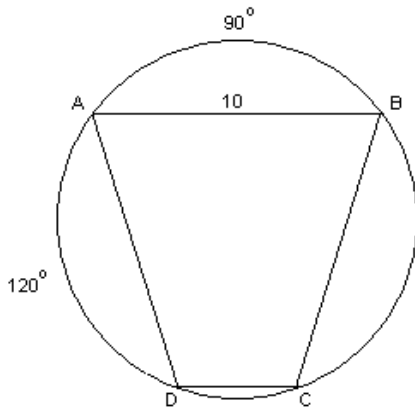
2. A train wheel is made up of a main wheel and a flange wheel (see diagram). $AB = 24$ cm. and $CD = 3$ cm. Find the cm. length of the radius(R) of the main wheel.

Ans. _____



3. In the figure, the measure of arc $AB = 90^\circ$, the measure of arcs AD and BC is 120° . If $AB = 10$, find the length of segment AD in simplest radical form.

Ans. _____



3. *Circles and Spheres*

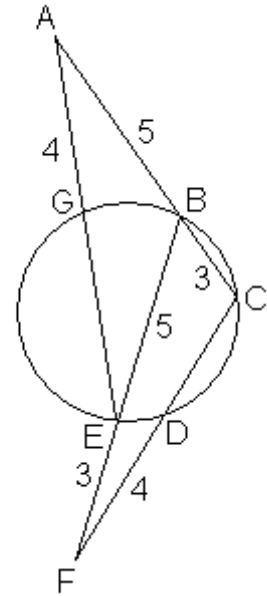
March 2005 (No Calculators)

1. If the radius of the earth is 4000 miles at the equator, how many more miles does it take to circle the earth at the equator at an altitude of 1 mile than it does at the surface. Express your answer in terms of π .

Ans. _____

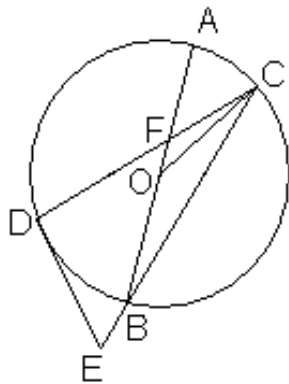
2. 2 secants are drawn to the circle shown from points A and F . Points B, C, D, E , and G are on the circle, and are also on the secants. 6 distances between points are shown. Find the perimeter of quadrilateral $ACFE$.

Ans. _____



3. In circle O , segment AB is a diameter, segment CE passes through B , segment DE is tangent to the circle at D , $m\angle AOC = 30^\circ$, and $m\angle CED = 50^\circ$. Find the $m\angle AFD$.

Ans. _____

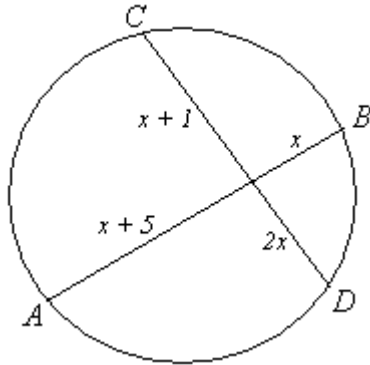


3. *Circles and Spheres*

March 2006 (No Calculators)

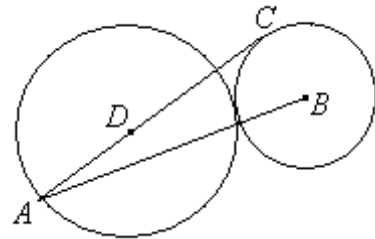
1. Given the circle as marked, find the numerical length of chord AB .

Ans. _____



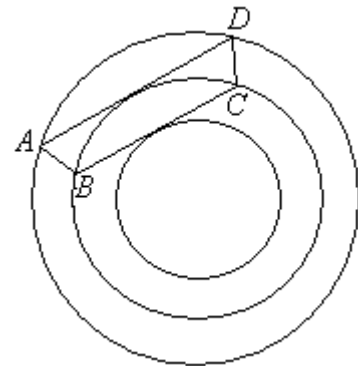
2. The circles have radii of 8 and 5. Tangent AC passes through the center D of the larger circle and is tangent to the smaller circle at C . Find the length of segment AB , where B is the center of the smaller circle.

Ans. _____



3. The radii of the three concentric circles are 6, 12, and 18. Tangent segments BC and AD have points of tangency which are collinear with their center. Find the length of segment DC in simplest and exact form.

Ans. _____



3. Circles and Spheres

March 2007 (No Calculators)

1. A circle is circumscribed about an equilateral triangle with side length 2. Another circle is inscribed in the triangle. Find the distance between the two circles. Express answer in simplest form.

Ans. _____

2. Eight congruent spheres are packed into a cube of edge length e , so that each of the spheres is tangent to three faces of a cube and also tangent to three other spheres. What is the distance between the centers of two spheres which are on the opposite corners, one on the top and one on the bottom? Express answer in simplest and correct form.

Ans. _____

3. To tightly bind together three cylindrical barrels, each with a diameter of 2 feet, a circular hoop is to be formed from metal strapping. What is the minimum length of strap required? Consider only the inside circumference of the strap. Round your answer to the nearest tenth.

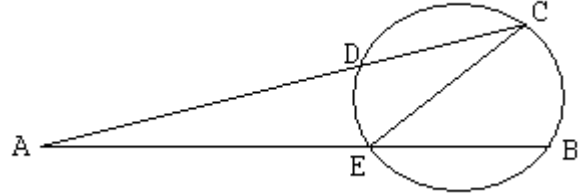
Ans. _____

3. *Circles and Spheres*

March 2008 (No Calculators)

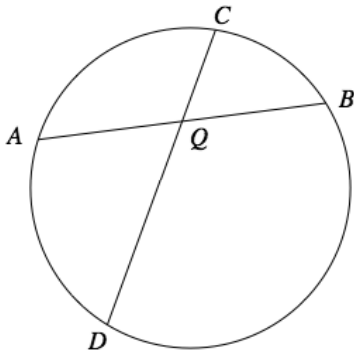
1. In the figure at right, $m\angle A = 25^\circ$ and $m\widehat{DE} = 50^\circ$. Find the degree measure of $\angle CEB$.

Ans. _____



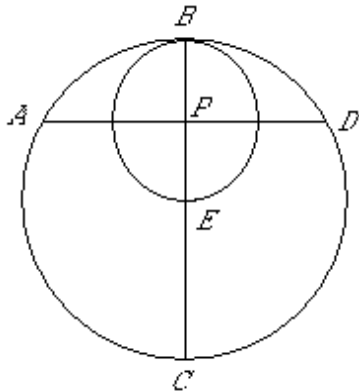
2. \overline{AB} and \overline{CD} are chords of the circle. \overline{CD} bisects \overline{AB} at Q . AQ is 3 units longer than CQ and 4 units shorter than DQ . Find the length of segment CD .

Ans. _____



3. Chord \overline{BC} of the larger circle below is the perpendicular bisector of chord \overline{AD} at P , the center of the smaller circle. E is the endpoint of the diameter of the smaller circle and the center of the larger circle. Find the ratio of AD to BE .

Ans. _____



3. *Circles and Spheres*

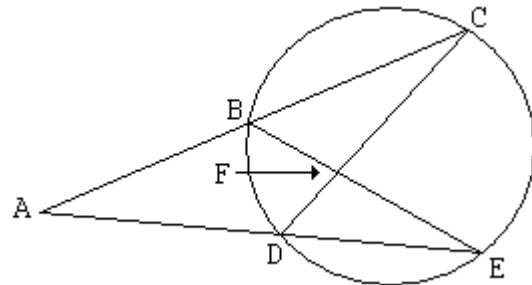
March 2009 (No Calculators)

1. Round Pond is circular with a diameter of 400 meters and it is still covered with ice that is great for skating. Kate can walk from her house to the closest part of the pond using a straight path 400 meters long. She can also take a different path that's also straight and reaches the pond in 500 meters. If she walks along the second path then skates across part of the pond in the same direction as the path she took, how many meters will she skate before getting to the shore?

Ans. _____

2. At right $m\angle A = 43^\circ$ and $m\angle DFE = 75^\circ$.
Find the measure of minor arc CE.

Ans. _____



3. Four tangent segments are drawn to a sphere from point P. The points of tangency form the vertices of a square. The measure of the angle between consecutive tangents from P is 60° . If the length of one of the tangent segments is 20, how far is P from the sphere?

Ans. _____

4. Conics

March 2000

1. Find the center of the circle whose equation is $x^2 + y^2 - y - 4x - 4\frac{3}{4} = 0$.

Ans. _____

2. An ellipse with center (4, 6) is tangent to the x-axis. Find its equation if its eccentricity is $\frac{\sqrt{3}}{2}$, and its major axis is parallel to the x-axis.

Ans. _____

3. The equation of the asymptotes of a hyperbola are $x - 2y = 11$ and $x + 2y = -1$. Find its equation if one of the endpoints of the conjugate axis is (5, -5).

Ans. _____

4. Conics

March 2001

1. Find the foci of the ellipse $16x^2 + 4y^2 = 64$.

Ans. _____

2. Find the equation of the hyperbola whose vertices are (5, 5) and (-11, 5) and whose foci are (-20, 5) and (14, 5).

Ans. _____

3. There are two tangent segments from the point (10, 7) to the circle $x^2 + y^2 + 6x - 14y + 33 = 0$. Find the points of tangency.

Ans. _____

4. Conics**March 2002**

1. Find the vertices of the ellipse whose equation is $x^2 + 4y^2 - 16x - 24y + 84 = 0$.

Ans. _____

2. The vertex and focus of a conic centered at the origin are $(0, 4)$ and $(0, 2\sqrt{13})$ respectively. Find the equation of the conic.

Ans. _____

3. The circle with center $(12, 5)$ is tangent to the line $7x - 24y = 89$. Find the equation of the circle.

Ans. _____**4. Conics****March 2003**

1. Find the distance between the foci of the ellipse $\frac{x^2}{225} + \frac{y^2}{625} = 1$.

Ans. _____

2. Given the hyperbola centered at the origin with a conjugate axis of length 10 and a y-intercept of 8, find its eccentricity. Express in simplest form.

Ans. _____

3. The two parabolas $y^2 - 2x - 6y + 1 = 0$ and $y^2 + 2x - 6y - 7 = 0$ when graphed enclose a region which appears to be elliptical in shape. Use the axes of the elliptical shape and their point of intersection as the center to form an equation of an ellipse. Express answer in $Ax^2 + By^2 + Cx + Dy + E = 0$ form, where $A, B, C, D,$ and E are integers and their GCF = 1.

Ans. _____

4. Conics**March 2004**

1. Find the center of the circle $x^2 + y^2 - 4x - 6y + 7 = 0$.

Ans. _____

2. Find the equation of the parabola in the form $x^2 + Ax + By + c = 0$ or $y^2 + Ax + By + C = 0$, if its directrix is $y = 3$ and focus is $(-3, -7)$.

Ans. _____

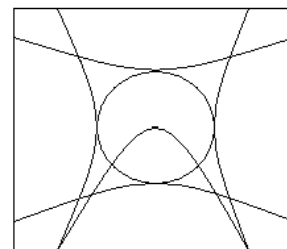
3. Find the equation of the circle whose center is the center of the hyperbola $7y^2 - 9x^2 - 28y - 54x = 116$, and two of whose points are the foci of the hyperbola.

Ans. _____**4. Conics****March 2005 (No Calculators)**

1. Find the value of k so that the equation $x^2 + y^2 - 6x - 8y + k = 0$ is the equation of a circle of radius 8.

Ans. _____

2. The drawing, entitled “MAML Happy Face”, is shown on the grid $|x| \leq 3$ and $|y| \leq 3$. It consist of the hyperbola $\frac{x^2}{4} - \frac{y^2}{9} = 1$ and its 90 degree rotation about the origin, a circle tangent to both the hyperbolas at 2 points, and a parabola with vertex at the center of the circle that intersects the hyperbola at the bottom of the graph, as shown. Find the equation of the parabola.

**Ans.** _____

3. Ellipse 1 has a semi-major axis of 2 that is parallel to the y-axis and a semi-minor axis of 1 that is parallel to the x-axis. Ellipse 1 is in the 1st quadrant and is tangent to both axes. Ellipse 2 has the same center and eccentricity as ellipse 1 and is internally tangent to it. The major axis of ellipse 2 is perpendicular to the major axis of ellipse 1. If the equation of ellipse 2 is written in the form $\frac{(x-h)^2}{a^2} + \frac{(y-k)^2}{b^2} = 1$, find $h+k+a+b$ as a number in simplest form.

Ans. _____

4. Conics

March 2006 (No Calculators)

1. Find the endpoints of the major axis of the ellipse $x^2 + 4y^2 = 16$.

Ans. _____

2. The center of an ellipse is $(-2, 5)$. The ellipse is tangent to both axes. Find the equation of the ellipse in the form of $Ax^2 + By^2 + Cx + Dy + E = 0$.

Ans. _____

3. Find the equation of the locus of points which are the same distance from the point $(9, 5)$ as they are from the line $x = -1$.

Ans. _____

4. Conics

March 2007 (No Calculators)

1. Find the center and radius of the circle $x^2 - 4x + y^2 + 10y = 7$.

Ans. _____

2. Tangent segments are drawn from the point $(25, 0)$ to circles centered at the origin. The lengths of the tangent segments and radii are natural numbers. If the circle equations are written in the form of $x^2 + y^2 = r^2$, find the sum of all r that produces circles of these specifications.

Ans. _____

3. Find the equation, in $\frac{(x-h)^2}{a^2} + \frac{(y-k)^2}{b^2} = 1$ form, for the ellipse described as the set of all points p whose distances from the points $(7, 2)$ and $(3, 2)$ add up to 12.

Ans. _____

4. Conics

March 2008 (No Calculators)

1. Find the equation of the set of all points which are exactly 5 units away from the origin on the xy coordinate plane.

Ans. _____

2. The foci of a hyperbola are $(-10, -4)$ and $(-6, -4)$. Find its equation if its eccentricity is 2.

Ans. _____

3. Circle A and ellipse B intersect at points P, Q, R, and S. $4x - 3y = 0$ contains the points P and R and the center of both the circle and the ellipse. $4x + 3y = 24$ contains the points Q and S and the center of the circle and the ellipse. Point Q is on the y -axis. Find the equation of the circle in standard form.

Ans. _____

4. Conics

March 2009 (No Calculators)

1. Circles centered at the origin pass through the following points: $(3, 10)$, $(5, 8)$, $(6, 7)$, $(4, 9)$. What is the equation of the smallest circle?

Ans. _____

2. Find the ordered pairs (x, y) which are coordinates of the endpoints of the minor axis of the ellipse whose equations is $9x^2 + 25y^2 - 9x + 150y + 225 = 0$.

Ans. _____

3. The equations of the asymptotes of a hyperbola are $5x - 4y = -59$ and $5x + 4y = -11$. If one of the vertices of the hyperbola is $(13, 6)$, find the equation of the hyperbola.

Ans. _____

5. *Arithmetic with Statistics*

March 2000

1. Find the product of $413_5 \times 32_5$ in base five.

Ans. _____

2. From the following data, find A such that the mean of set B equals the median of set B .
Set $B = \{1, 1, 3, A, 1, 0, -4\}$

Ans. _____

3. Find the sum of the mean, median and mode of the following data: $\sqrt{2}$, $\sqrt[3]{2}$, $\frac{\pi}{3}$, $\sqrt[4]{3}$, $\sqrt[4]{4}$, $\sqrt[3]{5}$ Round answer to the nearest 100th.

Ans. _____

5. *Arithmetic with Statistics*

March 2001 (You May Use a Calculator)

1. Determine the product of the mean, median and mode for 2, 5, 4, 7, 3, 5, 9

Ans. _____

2. The variance for a list of samples is defined as $V = \frac{\sum_{i=1}^n (x_i)^2 - \frac{\left(\sum_{i=1}^n x_i\right)^2}{n}}{n}$. Find the variance for the list: 1, 5, 7, 8, 4

Ans. _____

3. How many 3-digit numbers in base 5 are 3-digit numbers in base 8?

Ans. _____

5. *Arithmetic with Statistics*

February 2002 (You May Use a Calculator)

1. When the mode and median of the set of numbers $\{12, 2, 2, 32, 2, 16, 28\}$ are added to the set to form a new larger set, the mean of the new set is M . Find M .

Ans. _____

2. The arithmetic mean or average of the age of a group of doctors and lawyers is 40. If the average age of the doctors is 35 and the average age of the lawyers is 50, then what is the ratio of the number of doctors to the number of lawyers?

Ans. _____

3. When Toni got a grade of 98 on a certain test, it raised her test average by one point. But when she got a grade of 70 on the next test, her new average went down by two points. Including these two tests, how many tests did Toni take?

Ans. _____

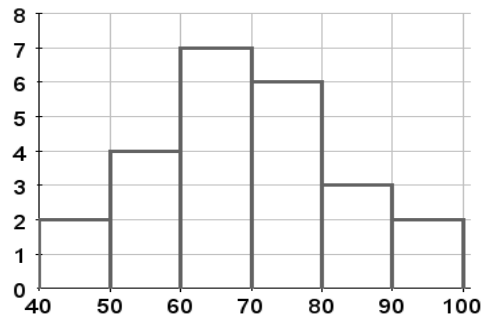
5. *Arithmetic with Statistics*

March 2003 (You May Use a Calculator)

1. On a certain day Ruth has 200 hits in 600 bats for a batting average of .3333.... Williams on the other hand has 199 hits in 600 at bats. On the next day, Ruth goes 8 hits for 8 at bats, while Williams goes 11 for 13. At the end of the day, what is the difference between the batting averages of the two players? Round your answer to the nearest hundred thousandth.

Ans. _____

2. The histogram shows the frequency distribution for the number of points scored in a game by the WHS basketball team over the course of a season. Assuming the points scored in each game is the mean of the range it falls in, what is the standard deviation to the nearest hundred?



Ans. _____

3. A pile of melons weighed 100 pounds and was 99 percent water by weight. On a hot day the pile dried out until it was only 98 percent water. How much did the pile weigh at this point?

Ans. _____

5. *Arithmetic with Statistics*

March 2004 (You May Use a Calculator)

1. Find A in the whole number $215,7A2$ such that the whole number is divisible by 36.

Ans. _____

2. Find the number N such that the data 5, 2, 3, 3, 4, N , 4, 4, 3, would have a mean which would be one more than the median of the data.

Ans. _____

3. From the list below Jill added a positive whole number so that the median and the mean of the 15 numbers is the same. Find the variance to the nearest 1000^{th} of the 15 numbers.

32, 56, 44, 49, 39, 33, 58, 63, 55, 42, 38, 53, 43, 60

Ans. _____

5. *Arithmetic with Statistics*

March 2005 (You May Use a Calculator)

1. You have a mean of 100 after your first ten Latin quizzes. For how many quizzes in a row beyond these ten can you get a zero for each and still maintain a mean of at least 60?

Ans. _____

2. Alice and Bert take a self-paced summer economics course lasting 2 months. They make a complicated bet: whoever has the higher test mean in each of the months wins an ice cream cone for the month, and whoever has the higher test mean for the whole course wins 3 more, for a total of 5 ice cream cones. If the results are as shown in the table, how many ice cream cones does Alice win?

Person	Alice	Bert	Alice	Bert
Month	July	July	August	August
Scores	78, 85, 80	83, 81, 82, 74	80, 62, 75, 72, 76	66, 73, 70, 80

Ans. _____

3. M is the data set 50, 81, 75, 63, 65, 48, 72, X , where X is an integer. The mean of M is an integer, and is greater than or equal to the smallest data value of M and less than or equal to the largest data value of M , neither of which is X . List all possible values of X that would cause set M to have a unique mode.

Ans. _____

5. *Arithmetic with Statistics*

March 2006 (You May Use a Calculator)

1. If the following fractions were arranged in descending order, which would be the first and which would be the last? Label your answer.

$$\frac{23}{31}, \frac{35}{49}, \frac{47}{63}, \frac{51}{69}, \frac{63}{89}$$

Ans. _____

2. The mean of a set of 5 numbers is 12. 4 numbers of the set are 9, 12, 14, and 11. Find the mean of the mode and the median of the set.

Ans. _____

3. In a dart game the following numbers of points were hit the given number of times: 8 pts - 12 times, 12 pts - 15 times, 20 pts - 16 times, and 15 pts - 9 times. If the mean is rounded to the nearest whole number, find the sum of the mean, median, and mode of the number of points.

Ans. _____

5. *Arithmetic with Statistics*

March 2007 (You May Use a Calculator)

1. The Spiranic High School's girl's basketball team finished 6 games with 37 points, 5 games with 42 points, 4 games with 53 points, and 3 games with 49 points. If the mean is rounded to the nearest whole number, what is the sum of the mean, median and mode of these game scores?

Ans. _____

2. Find the set of six integers such that the mean is 19, the mode is 21, the median is 20, the range is 10 and the maximum is 25. List the numbers in increasing order.

Ans. _____

3. A set of n numbers has a mean, or average, of n . A proper subset of this set has m elements ($m < n$) whose mean is m . What is the mean of the remaining $n - m$ numbers? Be sure your answer is in simplest form.

Ans. _____

5. *Arithmetic with Statistics*

March 2008 (You May Use a Calculator)

1. Find the GCF for the numbers 120, 255, and 405.

Ans. _____

2. In the data set $\{x, 5, 6, 3, 7, 5, 4\}$, find x such that the mean of the set subtract the median of the set equals 15.

Ans. _____

3. Below is a frequency chart. Find the least number of 3.6 tallies that must be added so that the mean and median of the set are equal.

Number	Frequency
3.1	x x x x
3.2	x x x
3.3	x x x x x x x
3.4	x x x x x x
3.5	x x x x x x x
3.6	?
3.7	x x

5. *Arithmetic with Statistics*

March 2009 (You May Use a Calculator)

1. Find the two smallest positive integers a and b which differ by 4, such that when one is divided by 6 it has a remainder of 5, and if the other is divided by 7 it has a remainder of 3.

Ans. _____

2. What element can be added to the data set $\{27, 15, 6, 19, 0, 31, 23, 15\}$ without changing the range, mode, mean, or median?

Ans. _____

3. Given the chart below showing the averages per game and the number of games bowled each month of a December through February bowling league season, find the minimum number of games bowler B must have bowled in January so that B's average for the whole three month season is 7 less than A's average.

		DEC	JAN	FEB
A	average	174	208	171
	# of games	56	51	64
B	average	164	199	166
	# of games	58	?	61