0110b

1 If $\sqrt{x-4} = 7$, what is the value of x?
1) 11
2) 18
3) 45
4) 53

2 The coordinates of $\triangle ABC$ are $A(1,1)$, $B(2,3)$, and $C(3,1)$. If $\triangle A'B'C'$ is the result of the transformation $D_2 \circ r_{y-\text{axis}}$, then $\triangle A'B'C'$ is
1) similar to $\triangle ABC$
2) congruent to $\triangle ABC$
3) a right triangle
4) an equilateral triangle

3 What is the value of $3\sum_{n=2}^{6}\dfrac{n}{2}$?
1) 10
2) 13
3) 30
4) 60

4 An equation of a parabola that has $x = 2$ as its axis of symmetry is
1) $y = x^2 - 4x + 1$
2) $y = x^2 - 2x + 3$
3) $y = 2x^2 + 8x - 3$
4) $y = 2x^2 + 4x - 7$

5 What is the solution set for the equation $|3 - 2x| = 5$?
1) $\{-1,4\}$
2) $\{1,-4\}$
3) $\{-1\}$
4) $\{4\}$

6 A central angle of $\dfrac{4\pi}{15}$ radians intercepts an arc whose degree measure is
1) 48
2) 72
3) 96
4) $\dfrac{4\pi}{15}$

7 If $\cos 2\theta = 1$, a value of θ is
1) 45°
2) 90°
3) 180°
4) 270°

8 If $\cos x = -0.7$ and $\csc x > 0$, the terminal side of angle x is located in Quadrant
1) I
2) II
3) III
4) IV

9 The graph of the equation $xy = 12$ is best described as
1) a circle
2) two lines
3) an ellipse
4) a hyperbola

1

10 The image of function f(x) is found by mapping each point on the function (x,y) to the point (y,x). This image is a reflection of f(x) in
1) the x-axis
2) the y-axis
3) the line whose equation is $y = x$
4) the line whose equation is $y = -x$

11 What is the inverse of the function $y = 3x - 2$?
1) $y = -3x + 2$
2) $y = \dfrac{x+2}{3}$
3) $y = \dfrac{x-2}{3}$
4) $3y = 2x$

12 Which equation represents the circle whose center is $(3,-1)$ and whose radius is $\sqrt{6}$?
1) $(x+3)^2 + (y-1)^2 = 36$
2) $(x-3)^2 + (y+1)^2 = 36$
3) $(x+3)^2 + (y-1)^2 = 6$
4) $(x-3)^2 + (y+1)^2 = 6$

13 Which expression is equivalent to $\dfrac{y-x}{x^2-y^2}$?
1) $\dfrac{1}{x-y}$
2) $\dfrac{-1}{x-y}$
3) $\dfrac{1}{x+y}$
4) $\dfrac{-1}{x+y}$

14 If $\log x = 3\log a - \log b$, then x is equal to
1) $\dfrac{3a}{b}$
2) $\dfrac{a^3}{b}$
3) $3a - b$
4) $a^3 - b$

15 Which expression is equivalent to b in the equation $V = \sqrt{a^4 b^{\frac{1}{3}}}$?
1) $\dfrac{V^6}{a^{12}}$
2) $\dfrac{V^5}{a^7}$
3) $\dfrac{V^2}{a^4}$
4) $\dfrac{V}{a^2}$

16 In the binomial expansion of $(x+y)^8$, what is the coefficient of the term containing $x^3 y^5$?
1) 15
2) 28
3) 56
4) 70

17 If R is inversely proportional to A, and $R = 4$ when $A = 100$, what is the value of R when $A = 250$?
1) 0.625
2) 1.6
3) 10
4) 6,250

18 If $m\angle A = 35$, $b = 3$, and $a = 4$, how many different triangles can be constructed?
1) No triangles can be constructed.
2) two triangles
3) one right triangle, only
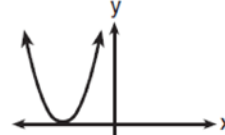4) one obtuse triangle, only

19 In a right triangle where one of the angles measures $30°$, what is the ratio of the length of the side opposite the $30°$ angle to the length of the side opposite the $90°$ angle?
1) $1:\sqrt{2}$
2) $1:2$
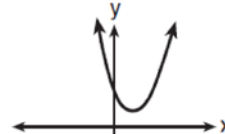3) $1:3$
4) $1:\sqrt{3}$

20 If zero is the value of the discriminant of the equation $ax^2 + bx + c = 0$, which graph best represents $y = ax^2 + bx + c$?
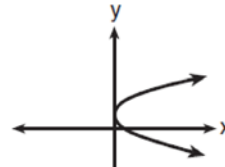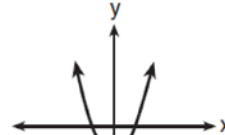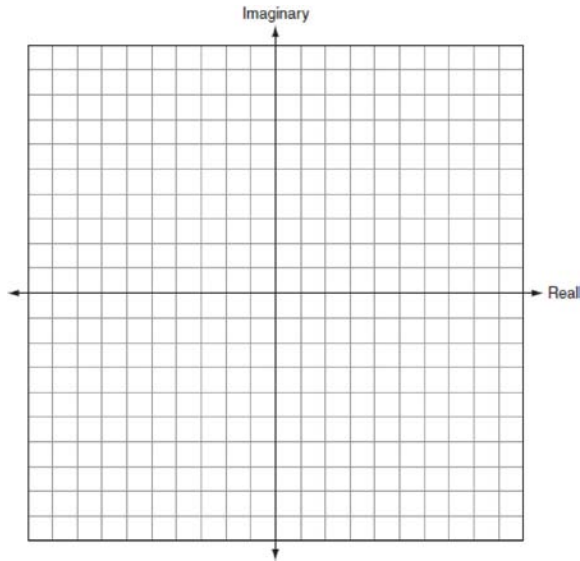

1)

2)

3)

4)

21 If $f(x) = 3x + 1$ and $g(x) = x^2 - 1$, find $(f \circ g)(2)$.

22 In $\triangle BAT$ and $\triangle CRE$, $\angle A \cong \angle R$ and $\overline{BA} \cong \overline{CR}$. Write *one* additional statement that could be used to prove that the two triangles are congruent. State the method that would be used to prove that the triangles are congruent.

23 Given the complex numbers $z_1 = 3 + 2i$ and $z_2 = -5 + 5i$. Find $z_1 - z_2$ and graph the result on the accompanying set of axes.

Imaginary

Real

24 The function, f, is drawn on the accompanying set of axes. On the same set of axes, sketch the graph of f^{-1}, the inverse of f.

y

x
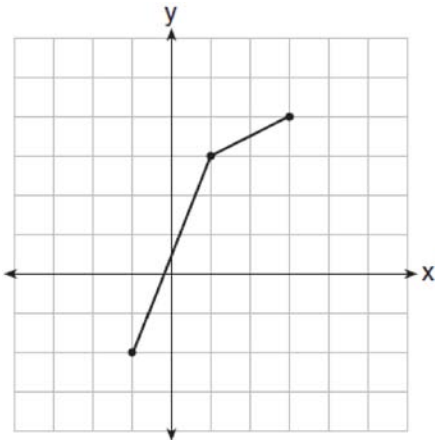
25 Express the sum of $4\sqrt{-12}$ and $3\sqrt{-27}$ in simplest radical form, in terms of i.

26 Express the reciprocal of $3 - \sqrt{7}$ in simplest radical form with a rational denominator.

27 In the accompanying diagram of $\triangle RST$, $RS = 30$ centimeters, $m\angle T = 105$, and $m\angle R = 40$. Find the area of $\triangle RST$, to the *nearest square centimeter*.

T

105°

40°
R   30 cm   S
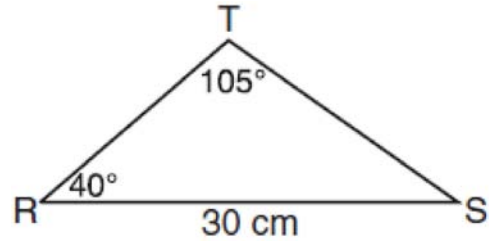
28 The mid-September statewide average gas prices, in dollars per gallon, (y), for the years since 2000, (x), are given in the table below.

Year Since 2000 (x)	Price Per Gallon (y)
1	1.345
2	1.408
3	1.537
4	1.58

Write a linear regression equation for this set of data. Using this equation, determine how much *more* the actual 2005 gas price was than the predicted gas price if the actual mid-September gas price for the year 2005 was $2.956.

4

29 Given: $J(-4,1)$, $E(-2,-3)$, $N(2,-1)$
Prove: $\triangle JEN$ is an isosceles right triangle.
[The use of the grid is optional.]
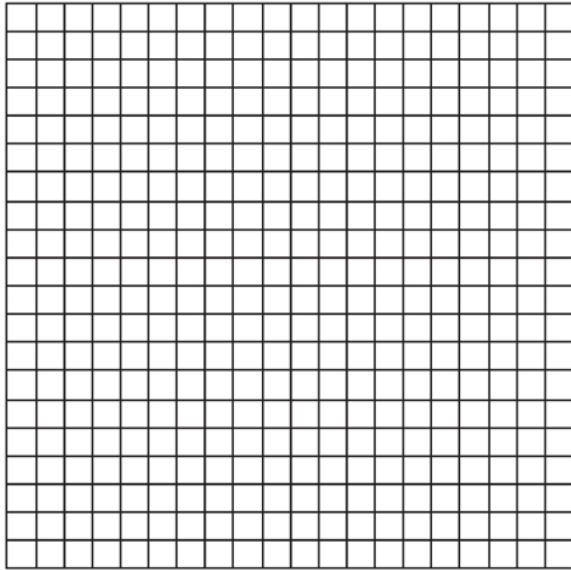
30 According to a federal agency, when a lie detector
test is given to a truthful person, the probability
that the test will show that the person is not telling
the truth is 20%. If a company interviews five
truthful candidates for a job and asks about thefts
from prior employers, what is the probability a lie
detector test will show that *at most* one candidate is
not telling the truth?

31 Currently, the population of the metropolitan
Waterville area is 62,700 and is increasing at an
annual rate of 3.25%. This situation can be
modeled by the equation $P(t) = 62,700(1.0325)^t$,
where $P(t)$ represents the total population and t
represents the number of years from now. Find the
population of the Waterville area, to the *nearest
hundred,* seven years from now. Determine how
many years, to the *nearest tenth,* it will take for the
original population to reach 100,000.
[Only an algebraic solution can receive full credit.]

32 A tractor stuck in the mud is being pulled out by
two trucks. One truck applies a force of 1,200
pounds, and the other truck applies a force of 1,700
pounds. The angle between the forces applied by
the two trucks is 72. Find the magnitude of the
resultant force, to the *nearest pound.*

33 In the accompanying diagram, $\overline{PA}$ is tangent to
circle O at A, chord $\overline{AC}$ and secant $\overline{PCED}$ are
drawn, and chords $\overline{AOB}$ and $\overline{CD}$ intersect at E. If
$m\overset{\frown}{AD} = 130$ and $m\angle BAC = 50$, find $m\angle P$, $m\angle BEC$,
and $m\angle PCA$.
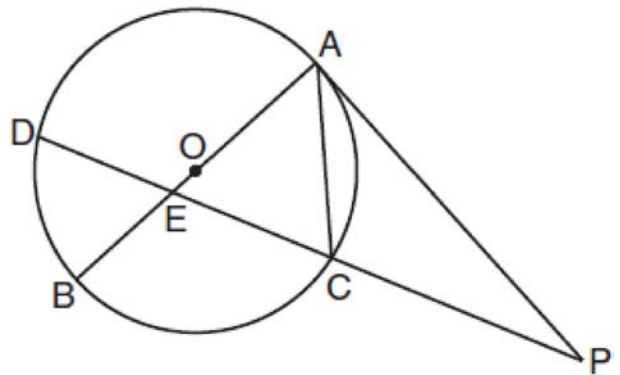
34 Solve for all values of x, to the *nearest tenth*:
$$\frac{1}{x} + \frac{1}{x+3} = 3$$

0110b
Answer Section

  1 ANS: 4   PTS: 2   REF: 011001b   STA: A2.A.22
      TOP: Solving Radicals
  2 ANS: 1   PTS: 2   REF: 011002b   STA: G.G.59
      TOP: Compositions of Transformations
  3 ANS: 3   PTS: 2   REF: 011003b   STA: A2.A.35
      TOP: Summations
  4 ANS: 3   PTS: 2   REF: 011004b   STA: A.A.41
      TOP: Identifying the Vertex of a Quadratic Given Equation
  5 ANS: 1   PTS: 2   REF: 011005b   STA: A2.A.1
      TOP: Absolute Value Equations
  6 ANS: 1   PTS: 2   REF: 011006b   STA: A2.M.2
      TOP: Radian Measure
  7 ANS: 3   PTS: 2   REF: 011007b   STA: A2.A.68
      TOP: Trigonometric Equations
  8 ANS: 2   PTS: 2   REF: 011008b   STA: A2.A.60
      TOP: Finding the Terminal Side of an Angle
  9 ANS: 4   PTS: 2   REF: 011009b   STA: A2.A.52
      TOP: Properties of Graphs of Functions and Relations
10 ANS: 3   PTS: 2   REF: 011010b   STA: A2.A.44
      TOP: Inverse of Functions
11 ANS: 2   PTS: 2   REF: 011011b   STA: A2.A.44
      TOP: Inverse of Functions
12 ANS: 4   PTS: 2   REF: 011012b   STA: G.G.71
      TOP: Writing Equations of Circles
13 ANS: 4   PTS: 2   REF: 011013b   STA: A.A.16
      TOP: Rational Expressions
14 ANS: 2   PTS: 2   REF: 011014b   STA: A2.A.19
      TOP: Properties of Logarithms
15 ANS: 1   PTS: 2   REF: 011015b   TOP: Transforming Formulas
16 ANS: 3   PTS: 2   REF: 011016b   STA: A2.A.36
      TOP: Binomial Expansions
17 ANS: 2   PTS: 2   REF: 011017b   STA: A2.A.5
      TOP: Inverse Variation
18 ANS: 4   PTS: 2   REF: 011018b   STA: A2.A.75
      TOP: Law of Sines - The Ambiguous Case
19 ANS: 2   PTS: 2   REF: 011019b   TOP: 30-60-90 Triangles
20 ANS: 2   PTS: 2   REF: 011020b   STA: A2.A.2
      TOP: Using the Discriminant
21 ANS:
      10

      PTS: 2   REF: 011021b   STA: A2.A.42   TOP: Compositions of Functions

22 ANS:
$\angle B \cong \angle C$ and ASA, or $\angle T \cong \angle E$ and AAS, or $\overline{AT} \cong \overline{RE}$ and SAS
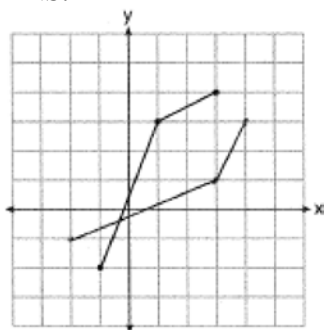
PTS: 2   REF: 011022b   STA: G.G.27   TOP: Congruency Proofs

23 ANS:

$8 - 3i$
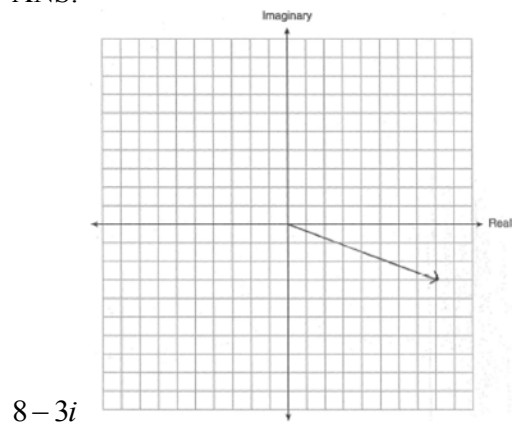
PTS: 2   REF: 011023b   TOP: Graphing Complex Numbers

24 ANS:

PTS: 2   REF: 011024b   STA: A2.A.44   TOP: Inverse of Functions

25 ANS:
$17i\sqrt{3}$

PTS: 2   REF: 011025b   STA: A2.N.6   TOP: Square Roots of Negative Numbers

26 ANS:
$\dfrac{3 + \sqrt{7}}{2}$

PTS: 2   REF: 011026b   STA: A2.N.5   TOP: Rationalizing Denominators
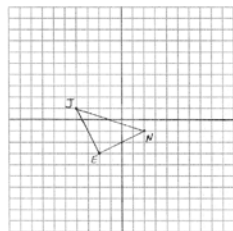
27 ANS:
172

PTS: 4   REF: 011027b   STA: A2.A.74   TOP: Using Trigonometry to Find Area

28 ANS:
$y = 0.0834x + 1.259$, 1.28

PTS: 4   REF: 011028b   STA: A2.S.7   TOP: Linear Regression

29 ANS:

To prove that $\triangle JEN$ is a right triangle, prove that its legs are perpendicular by showing their slopes are opposite reciprocals: $m_{\overline{JE}} = \dfrac{1--3}{-4--2} = \dfrac{4}{-2} = -2$

$$m_{\overline{EN}} = \dfrac{-3--1}{-2-2} = \dfrac{-2}{-4} = \dfrac{1}{2}$$

To prove that $\triangle JEN$ is an isosceles triangle, prove that it legs are congruent by using the distance formula:

$$d_{\overline{JE}} = \sqrt{(-4-(-2))^2 + (1-(-3))^2} = \sqrt{20}$$

$$d_{\overline{EN}} = \sqrt{(-2-2)^2 + (-3--1)^2} = \sqrt{20}$$

PTS: 4   REF: 011029b   STA: G.G.69   TOP: Coordinate Proofs
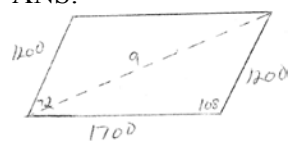
30 ANS:
$\dfrac{2304}{3125}$

PTS: 4   REF: 011030b   STA: A2.S.15   TOP: Binomial Probability
KEY: at least or at most

31 ANS:
78,400, 14.6

PTS: 4   REF: 011031b   STA: A2.A.6   TOP: Exponential Growth

32 ANS:

          2364

PTS: 4   REF: 011032b   STA: A2.A.73   TOP: Law of Cosines

33 ANS:
25, 115, 115

PTS: 6   REF: 011033b   STA: G.G.51   TOP: Chords, Secants and Tangents

34   ANS:
0.4 and –2.7

PTS: 6   REF: 011034b   STA: A2.A.23   TOP: Solving Rationals
KEY: irrational and complex solutions