Geometry Regents Exam 0615
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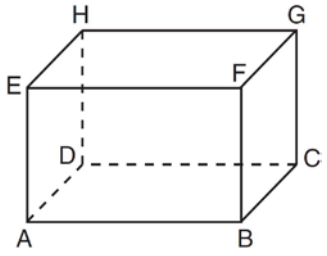
0615ge

1 Quadrilateral $ABCD$ undergoes a transformation, producing quadrilateral $A'B'C'D'$. For which transformation would the area of $A'B'C'D'$ *not* be equal to the area of $ABCD$?
1) a rotation of 90° about the origin
2) a reflection over the y-axis
3) a dilation by a scale factor of 2
4) a translation defined by $(x, y) \rightarrow (x + 4, y - 1)$

2 The diameter of a sphere is 12 inches. What is the volume of the sphere to the *nearest cubic inch*?
1) 288
2) 452
3) 905
4) 7,238

3 A right rectangular prism is shown in the diagram below.

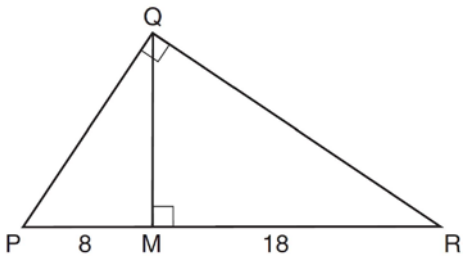


Which line segments are coplanar?
1) $\overline{EF}$ and $\overline{BC}$
2) $\overline{HD}$ and $\overline{FG}$
3) $\overline{GH}$ and $\overline{FB}$
4) $\overline{EA}$ and $\overline{GC}$

4 What are the coordinates of the image of point $A(2, -7)$ under the translation $(x, y) \rightarrow (x - 3, y + 5)$?
1) $(-1, -2)$
2) $(-1, 2)$
3) $(5, -12)$
4) $(5, 12)$

5 Point M is the midpoint of $\overline{AB}$. If the coordinates of M are $(2, 8)$ and the coordinates of A are $(10, 12)$, what are the coordinates of B?
1) $(6, 10)$
2) $(-6, 4)$
3) $(-8, -4)$
4) $(18, 16)$

6 In the diagram below, $\overline{QM}$ is an altitude of right triangle PQR, $PM = 8$, and $RM = 18$.



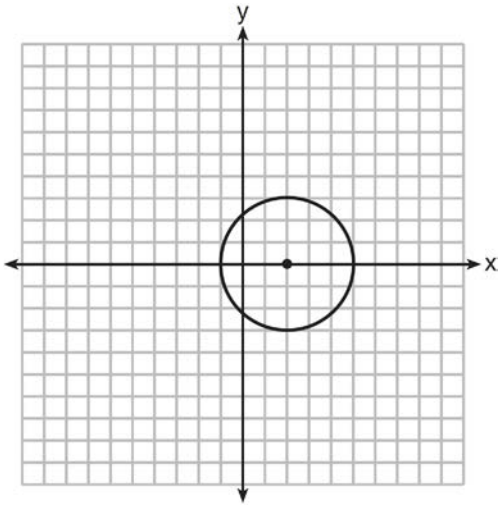
What is the length of $\overline{QM}$?
1) 20
2) 16
3) 12
4) 10

7 What is an equation of the line that passes through the point $(2, 4)$ and is perpendicular to the line whose equation is $3y = 6x + 3$?
1) $y = -\frac{1}{2}x + 5$
2) $y = -\frac{1}{2}x + 4$
3) $y = 2x - 6$
4) $y = 2x$

8 In all isosceles triangles, the exterior angle of a base angle must always be
1) a right angle
2) an acute angle
3) an obtuse angle
4) equal to the vertex angle

9 If $\Delta W'X'Y'$ is the image of ΔWXY after the transformation $R_{90°}$, which statement is *false*?
1) $XY = X'Y'$
2) $\overline{WX} \parallel \overline{W'X'}$
3) $\Delta WXY \cong \Delta W'X'Y'$
4) $m\angle XWY = m\angle X'W'Y'$

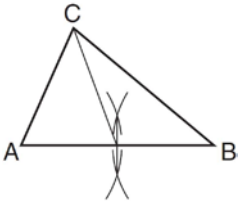
10 Which equation represents the circle shown in the graph below?



1) $(x-2)^2 + y^2 = 9$
2) $(x+2)^2 + y^2 = 9$
3) $(x-2)^2 + y^2 = 3$
4) $(x+2)^2 + y^2 = 3$

11 In quadrilateral $ABCD$, each diagonal bisects opposite angles. If $m\angle DAB = 70$, then $ABCD$ must be a
1) rectangle
2) trapezoid
3) rhombus
4) square

12 Which diagram illustrates a correct construction of an altitude of ΔABC?

1)


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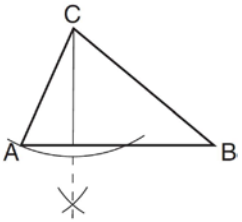

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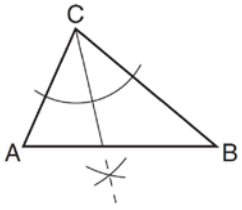
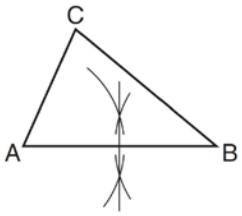


4)


13 From external point A, two tangents to circle O are drawn. The points of tangency are B and C. Chord $\overline{BC}$ is drawn to form ΔABC. If $m\angle ABC = 66$, what is $m\angle A$?
1) 33
2) 48
3) 57
4) 66

14 Point A lies on plane $\mathcal{P}$. How many distinct lines passing through point A are perpendicular to plane $\mathcal{P}$?

1) 1
2) 2
3) 0
4) infinite

15 Students made four statements about a circle.

A: The coordinates of its center are $(4, -3)$.

B: The coordinates of its center are $(-4, 3)$.

C: The length of its radius is $5\sqrt{2}$.

D: The length of its radius is 25.

If the equation of the circle is $(x+4)^2 + (y-3)^2 = 50$, which statements are correct?

1) A and C
2) A and D
3) B and C
4) B and D

16 Points A, B, C, and D are located on circle O, forming trapezoid $ABCD$ with $\overline{AB} \parallel \overline{DC}$. Which statement must be true?

1) $\overline{AB} \cong \overline{DC}$
2) $\overset{\frown}{AD} \cong \overset{\frown}{BC}$
3) $\angle A \cong \angle D$
4) $\overset{\frown}{AB} \cong \overset{\frown}{DC}$

17 If $\triangle ABC \sim \triangle LMN$, which statement is *not* always true?

1) $m\angle A \cong m\angle N$
2) $m\angle B \cong m\angle M$
3) $\dfrac{\text{area of } \triangle ABC}{\text{area of } \triangle LMN} = \dfrac{(AC)^2}{(LN)^2}$
4) $\dfrac{\text{perimeter of } \triangle ABC}{\text{perimeter of } \triangle LMN} = \dfrac{AB}{LM}$

18 The equations of lines k, m, and n are given below.

$k: 3y + 6 = 2x$

$m: 3y + 2x + 6 = 0$

$n: 2y = 3x + 6$

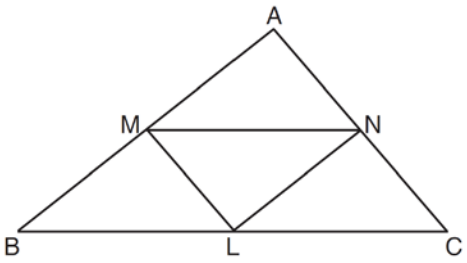
Which statement is true?

1) $k \parallel m$
2) $n \parallel m$
3) $m \perp k$
4) $m \perp n$

19 A regular polygon with an exterior angle of 40° is a

1) pentagon
2) hexagon
3) nonagon
4) decagon

20 In $\triangle ABC$ shown below, L is the midpoint of $\overline{BC}$, M is the midpoint of $\overline{AB}$, and N is the midpoint of $\overline{AC}$.



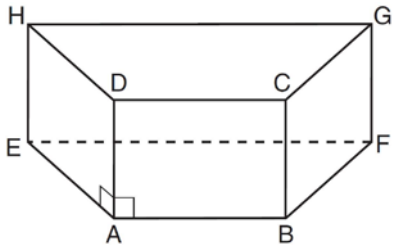
If $MN = 8$, $ML = 5$, and $NL = 6$, the perimeter of trapezoid $BMNC$ is

1) 26
2) 28
3) 30
4) 35

21 The sum of the interior angles of a regular polygon is 720°. How many sides does the polygon have?

1) 8
2) 6
3) 5
4) 4

22 In the prism shown below, $\overline{AD} \perp \overline{AE}$ and $\overline{AD} \perp \overline{AB}$.



Which plane is perpendicular to $\overline{AD}$?
1) HEA
2) BAD
3) EAB
4) EHG

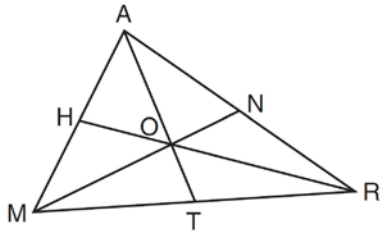
23 In ΔABC, $m\angle A = 65$ and $m\angle B$ is greater than $m\angle A$. The lengths of the sides of ΔABC in order from smallest to largest are
1) $\overline{AB}, \overline{BC}, \overline{AC}$
2) $\overline{BC}, \overline{AB}, \overline{AC}$
3) $\overline{AC}, \overline{BC}, \overline{AB}$
4) $\overline{AB}, \overline{AC}, \overline{BC}$

24 Which equation represents a circle whose center is the origin and that passes through the point $(-4, 0)$?
1) $x^2 + y^2 = 8$
2) $x^2 + y^2 = 16$
3) $(x+4)^2 + y^2 = 8$
4) $(x+4)^2 + y^2 = 16$

25 The lengths of two sides of a triangle are 7 and 11. Which inequality represents all possible values for x, the length of the third side of the triangle?
1) $4 \le x \le 18$
2) $4 < x \le 18$
3) $4 \le x < 18$
4) $4 < x < 18$

26 Which statement is the inverse of "If $x + 3 = 7$, then $x = 4$"?
1) If $x = 4$, then $x + 3 = 7$.
2) If $x \neq 4$, then $x + 3 \neq 7$.
3) If $x + 3 \neq 7$, then $x \neq 4$.
4) If $x + 3 = 7$, then $x \neq 4$.

27 In the diagram below of ΔMAR, medians $\overline{MN}$, $\overline{AT}$, and $\overline{RH}$ intersect at O.

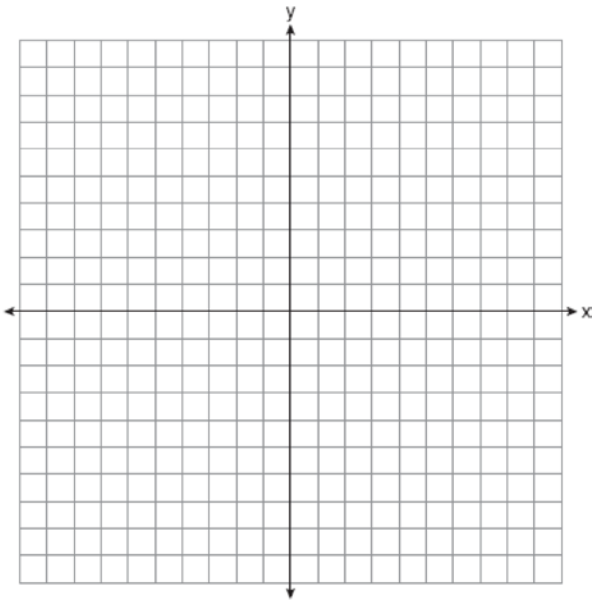


If $TO = 10$, what is the length of $\overline{TA}$?
1) 30
2) 25
3) 20
4) 15

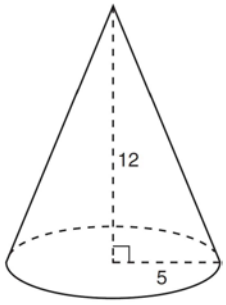
28 What is an equation of the line that passes through the point $(4, 5)$ and is parallel to the line whose equation is $y = \frac{2}{3}x - 4$?
1) $2y + 3x = 11$
2) $2y + 3x = 22$
3) $3y - 2x = 2$
4) $3y - 2x = 7$

29 The measures of the angles of a triangle are in the ratio $5:6:7$. Determine the measure, in degrees, of the *smallest* angle of the triangle.

30 Triangle ABC has vertices $A(-1,1)$, $B(1,3)$, and $C(4,1)$. The image of ΔABC after the transformation $r_{y=x}$ is $\Delta A'B'C'$. State and label the coordinates of $\Delta A'B'C'$. [The use of the set of axes below is optional.]

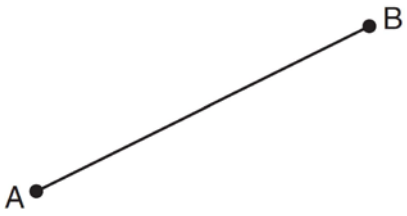


31 As shown in the diagram below, a right circular cone has a height of 12 and a radius of 5.



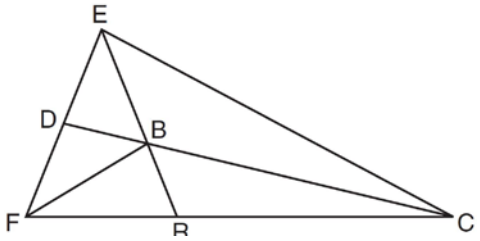
Determine, in terms of π, the lateral area of the right circular cone.

32 Using a compass and straightedge, locate the midpoint of $\overline{AB}$ by construction. [Leave all construction marks.]



33 The coordinates of the endpoints of $\overline{CD}$ are $C(3,8)$ and $D(6,-1)$. Find the length of $\overline{CD}$ in simplest radical form.

34 In the diagram below, point B is the incenter of ΔFEC, and $\overline{EBR}$, $\overline{CBD}$, and $\overline{FB}$ are drawn.

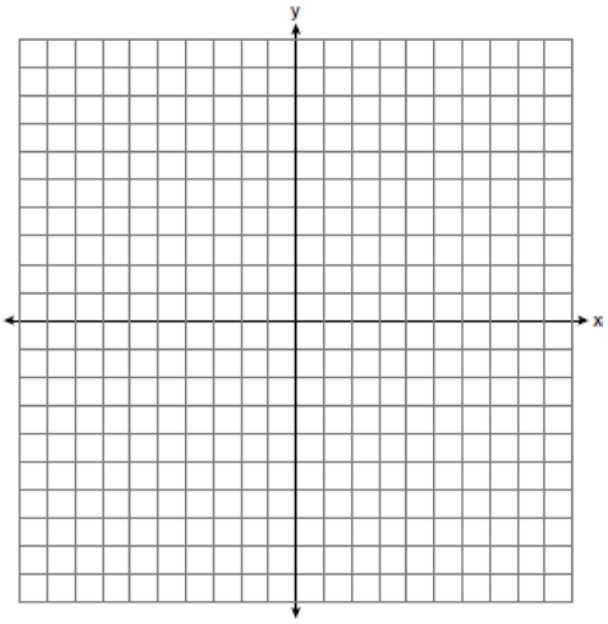


If $m\angle FEC = 84$ and $m\angle ECF = 28$, determine and state $m\angle BRC$.

35 Solve the following system of equations graphically. State the coordinates of all points in the solution.

$$y + 4x = x^2 + 5$$

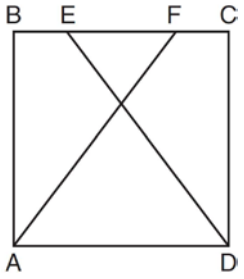
$$x + y = 5$$



36 In parallelogram $ABCD$, with diagonal $\overline{AC}$ drawn, $m\angle BCA = 4x + 2$, $m\angle DAC = 6x - 6$, $m\angle BAC = 5y - 1$, and $m\angle DCA = 7y - 15$. Determine $m\angle B$.

37 Point P is 5 units from line j. Sketch the locus of points that are 3 units from line j and also sketch the locus of points that are 8 units from P. Label with an **X** all points that satisfy *both* conditions.

38 The diagram below shows square $ABCD$ where E and F are points on $\overline{BC}$ such that $\overline{BE} \cong \overline{FC}$, and segments AF and DE are drawn. Prove that $\overline{AF} \cong \overline{DE}$.



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Answer Section

1 ANS: 3 PTS: 2 REF: 061501ge STA: G.G.61
TOP: Analytical Representations of Transformations

2 ANS: 3

$V = \frac{2}{3}\pi\left(\frac{12}{2}\right)^3 \approx 905$

PTS: 2 REF: 061502ge STA: G.G.16 TOP: Volume and Surface Area

3 ANS: 4 PTS: 2 REF: 061503ge STA: G.G.10
TOP: Solids

4 ANS: 1

$(2,-7) \rightarrow (2-3,-7+5) = (-1,-2)$

PTS: 2 REF: 061504ge STA: G.G.61
TOP: Analytical Representations of Transformations

5 ANS: 2

$2 = \frac{10+x}{2}. \quad 8 = \frac{12+y}{2}$

$4 = 10 + x \quad 16 = 12 + y$

$-6 = x \qquad 4 = y$

PTS: 2 REF: 061505ge STA: G.G.66 TOP: Midpoint

6 ANS: 3

$x^2 = 8 \times 18$

$x^2 = 144$

$x = 12$

PTS: 2 REF: 061506ge STA: G.G.47 TOP: Similarity
KEY: altitude

7 ANS: 1

$m = \frac{6}{3} = 2 \quad m_{\perp} = -\frac{1}{2} \quad 4 = -\frac{1}{2}(2) + b$

$4 = -1 + b$

$5 = b$

PTS: 2 REF: 061507ge STA: G.G.64 TOP: Parallel and Perpendicular Lines

8 ANS: 3 PTS: 2 REF: 061508ge STA: G.G.32
TOP: Exterior Angle Theorem

9 ANS: 2 PTS: 2 REF: 061509ge STA: G.G.55
TOP: Properties of Transformations

10 ANS: 1 PTS: 2 REF: 061510ge STA: G.G.72
TOP: Equations of Circles

11 ANS: 3

Diagonals of rectangles and trapezoids do not bisect opposite angles. m$\angle DAB = 90$ if $ABCD$ is a square.

PTS: 2 REF: 061511ge STA: G.G.39 TOP: Special Parallelograms

12 ANS: 2 PTS: 2 REF: 061512ge STA: G.G.19
TOP: Constructions

13 ANS: 2

$180 - 2(66) = 48$

PTS: 2 REF: 061513ge STA: G.G.50 TOP: Tangents
KEY: two tangents

14 ANS: 1 PTS: 2 REF: 061514ge STA: G.G.3
TOP: Planes

15 ANS: 3

$r^2 = 50$

$r = \sqrt{50} = \sqrt{25}\sqrt{2} = 5\sqrt{2}$

PTS: 2 REF: 061515ge STA: G.G.73 TOP: Equations of Circles

16 ANS: 2 PTS: 2 REF: 061516ge STA: G.G.52
TOP: Chords

17 ANS: 1 PTS: 2 REF: 061517ge STA: G.G.45
TOP: Similarity KEY: perimeter and area

18 ANS: 4

$k: m = \frac{2}{3}$ $m: m = \frac{-A}{B} = \frac{-2}{3}$ $n: m = \frac{3}{2}$

PTS: 2 REF: 061518ge STA: G.G.63 TOP: Parallel and Perpendicular Lines

19 ANS: 3

$$180 - \frac{(n-2)180}{n} = 40$$

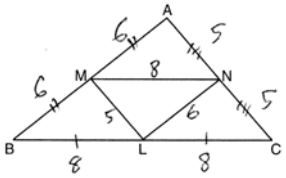
$$180n - 180n + 360 = 40n$$

$$360 = 40n$$

$$n = 9$$

PTS: 2 REF: 061519ge STA: G.G.37 TOP: Interior and Exterior Angles of Polygons

20 ANS: 4



PTS: 2 REF: 061520ge STA: G.G.42 TOP: Midsegments

21 ANS: 2

$180(n-2) = 720$

$n - 2 = 4$

$n = 6$

PTS: 2 REF: 061521ge STA: G.G.37 TOP: Interior and Exterior Angles of Polygons

22 ANS: 3 PTS: 2 REF: 061522ge STA: G.G.1
TOP: Planes

23 ANS: 1 PTS: 2 REF: 061523ge STA: G.G.34
TOP: Angle Side Relationship

24 ANS: 2 PTS: 2 REF: 061524ge STA: G.G.71
TOP: Equations of Circles

25 ANS: 4

$11 - 7 = 4, 11 + 7 = 18$

PTS: 2 REF: 061525ge STA: G.G.33 TOP: Triangle Inequality Theorem

26 ANS: 3 PTS: 2 REF: 061526ge STA: G.G.26
TOP: Inverse

27 ANS: 1 PTS: 2 REF: 061527ge STA: G.G.43
TOP: Centroid

28 ANS: 4

$\frac{2}{3}(x-4) = y - 5$

$2x - 8 = 3y - 15$

$7 = 3y - 2x$

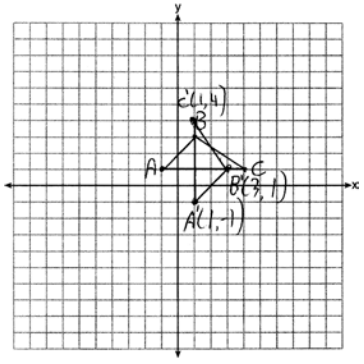
PTS: 2 REF: 061528ge STA: G.G.65 TOP: Parallel and Perpendicular Lines

29 ANS:

$\frac{5}{5+6+7} \cdot 180 = 50$

PTS: 2 REF: 061529ge STA: G.G.30 TOP: Interior and Exterior Angles of Triangles

30 ANS:



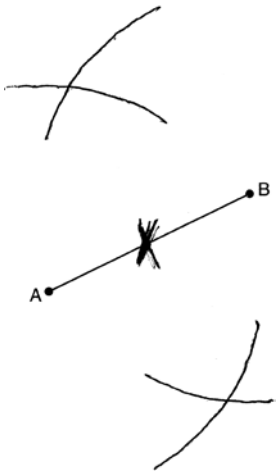
PTS: 2 REF: 061530ge STA: G.G.54 TOP: Reflections
KEY: grids

31 ANS:

$l = \sqrt{12^2 + 5^2} = \sqrt{169} = 13 \quad L = \pi r l = \pi(5)(13) = 65\pi$

PTS: 2 REF: 061531ge STA: G.G.15 TOP: Volume and Lateral Area

32 ANS:



PTS: 2 REF: 061532ge STA: G.G.18 TOP: Constructions

33 ANS:

$\sqrt{(6-3)^2 + (-1-8)^2} = \sqrt{9+81} = \sqrt{90} = \sqrt{9}\sqrt{10} = 3\sqrt{10}.$

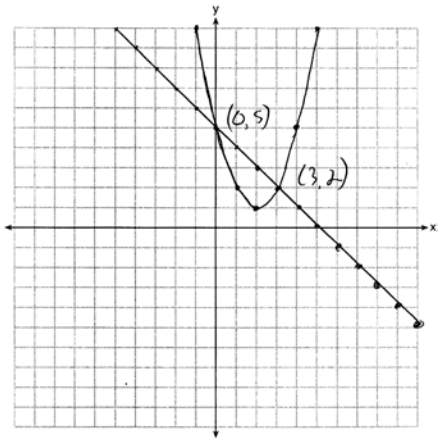
PTS: 2 REF: 061533ge STA: G.G.67 TOP: Distance

34 ANS:

$180 - \left(\frac{84}{2} + 28\right) = 180 - 70 = 110$

PTS: 2 REF: 061534ge STA: G.G.21
TOP: Centroid, Orthocenter, Incenter and Circumcenter

35 ANS:



PTS: 4 REF: 061535ge STA: G.G.70 TOP: Quadratic-Linear Systems

36 ANS:

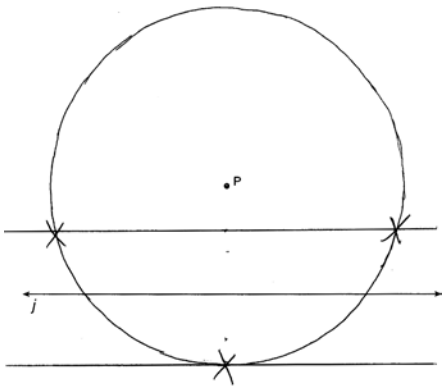
$6x - 6 = 4x + 2$ $m\angle BCA = 4(4) + 2 = 18$ $7y - 15 = 5y - 1$ $m\angle BAC = 5(7) - 1 = 34$ $m\angle B = 180 - (18 + 34) = 128$

$2x = 8$ $2y = 14$

$x = 4$ $y = 7$

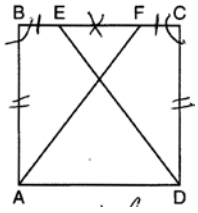
PTS: 4 REF: 061536ge STA: G.G.38 TOP: Parallelograms

37 ANS:



PTS: 4 REF: 061537ge STA: G.G.22 TOP: Locus

38 ANS:



Square $ABCD$; E and F are points on $\overline{BC}$ such that $\overline{BE} \cong \overline{FC}$; $\overline{AF}$ and $\overline{DE}$ drawn (Given). $\overline{AB} \cong \overline{CD}$ (All sides of a square are congruent). $\angle ABF \cong \angle DCE$ (All angles of a square are equiangular). $\overline{EF} \cong \overline{FE}$ (Reflexive property). $\overline{BE} + \overline{EF} \cong \overline{FC} + \overline{FE}$ (Additive property of line segments). $\overline{BF} \cong \overline{CE}$ (Angle addition). $\Delta ABF \cong \Delta DCE$ (SAS). $\overline{AF} \cong \overline{DE}$ (CPCTC).

PTS: 6 REF: 061538ge STA: G.G.27 TOP: Quadrilateral Proofs