Name: _____   Date: _____

GEOMETRY LIVE REVIEW PROBLEMS - 2019
eMATHinstruction

## RIGID MOTION TRANSFORMATIONS AND CONGRUENCY

June 2015

2 The vertices of $\triangle JKL$ have coordinates $J(5,1)$, $K(-2,-3)$, and $L(-4,1)$. Under which transformation is the image $\triangle J'K'L'$ *not* congruent to $\triangle JKL$?

   (1) a translation of two units to the right and two units down

   (2) a counterclockwise rotation of 180 degrees around the origin

   (3) a reflection over the x-axis

   (4) a dilation with a scale factor of 2 and centered at the origin

June 2015

**4** In the diagram below, congruent figures 1, 2, and 3 are drawn.
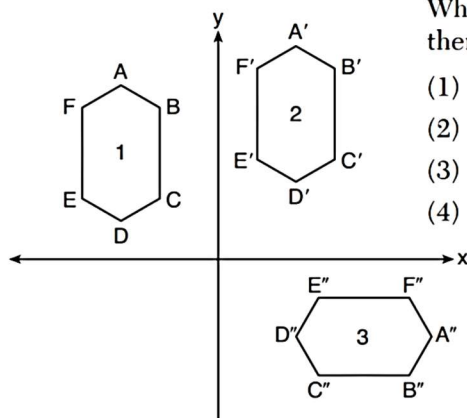
Which sequence of transformations maps figure 1 onto figure 2 and then figure 2 onto figure 3?

   (1) a reflection followed by a translation

   (2) a rotation followed by a translation

   (3) a translation followed by a reflection

   (4) a translation followed by a rotation

January 2016

**11** Quadrilateral $ABCD$ is graphed on the set of axes below.
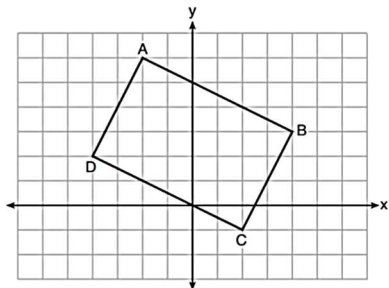
   (1) no and $C'(1,2)$ (3) yes and $A'(6,2)$

   (2) no and $D'(2,4)$ (4) yes and $B'(-3,4)$

When $ABCD$ is rotated 90° in a counterclockwise direction about the origin, its image is quadrilateral $A'B'C'D'$. Is distance preserved under this rotation, and which coordinates are correct for the given vertex?
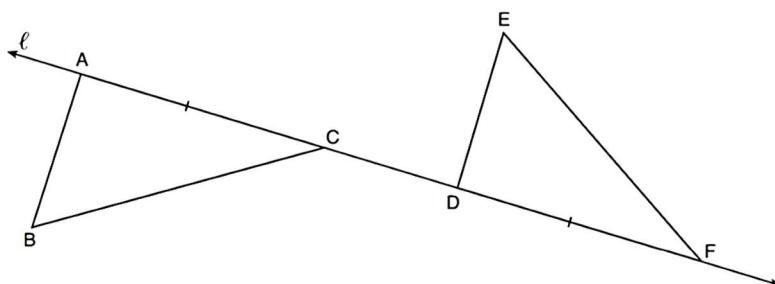
January 2016

28 As graphed on the set of axes below, $\triangle A'B'C'$ is the image of $\triangle ABC$ after a sequence of transformations.
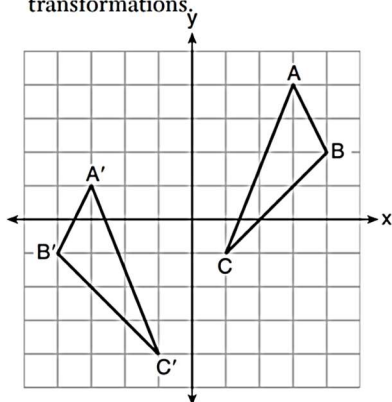
Is $\triangle A'B'C'$ congruent to $\triangle ABC$? Use the properties of rigid motion to explain your answer.

August 2015

34 In the diagram below, $\overline{AC} \cong \overline{DF}$ and points A, C, D, and F are collinear on line ℓ.
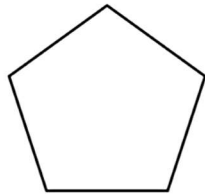

Let $\triangle D'E'F'$ be the image of $\triangle DEF$ after a translation along ℓ, such that point D is mapped onto point A. Determine and state the location of F'. Explain your answer.

Let $\triangle D''E''F''$ be the image of $\triangle D'E'F'$ after a reflection across line ℓ. Suppose that E'' is located at B. Is $\triangle DEF$ congruent to $\triangle ABC$? Explain your answer.

June 2018
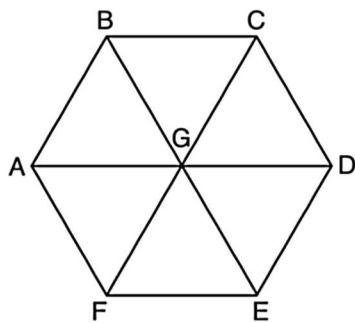
19 The regular polygon below is rotated about its center.

Which angle of rotation will carry the figure onto itself?

(1) 60°

(3) 216°

(2) 108°

(4) 540°

August 2018

4 In regular hexagon $ABCDEF$ shown below, $\overline{AD}$, $\overline{BE}$, and $\overline{CF}$ all intersect at G.

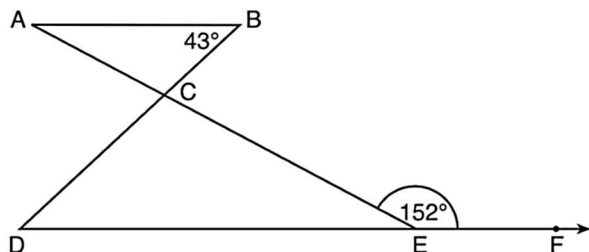When $\triangle ABG$ is reflected over $\overline{BG}$ and then rotated 180° about point G, $\triangle ABG$ is mapped onto

(1) $\triangle FEG$

(3) $\triangle CBG$

(2) $\triangle AFG$

(4) $\triangle DEG$

PARALLEL LINES

June 2018

2 In the diagram below, $\overrightarrow{AB} \parallel \overrightarrow{DEF}$, $\overline{AE}$ and $\overline{BD}$ intersect at C, m$\angle B = 43°$, and m$\angle CEF = 152°$.
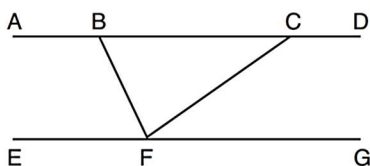
Which statement is true?

(1) m$\angle D = 28°$ (3) m$\angle ACD = 71°$

(2) m$\angle A = 43°$ (4) m$\angle BCE = 109°$

June 2015

17 Steve drew line segments $ABCD$, EFG, BF, and CF as shown in the diagram below. Scalene $\triangle BFC$ is formed.
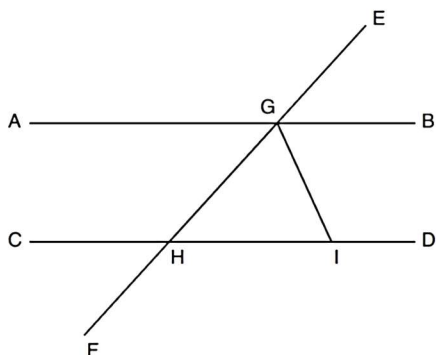
Which statement will allow Steve to prove $\overline{ABCD} \parallel \overline{EFG}$?

(1) $\angle CFG \cong \angle FCB$ (3) $\angle EFB \cong \angle CFB$

(2) $\angle ABF \cong \angle BFC$ (4) $\angle CBF \cong \angle GFC$

June 2015

32 In the diagram below, $\overleftrightarrow{EF}$ intersects $\overline{AB}$ and $\overline{CD}$ at G and H, respectively, and $\overline{GI}$ is drawn such that $\overline{GH} \cong \overline{IH}$.
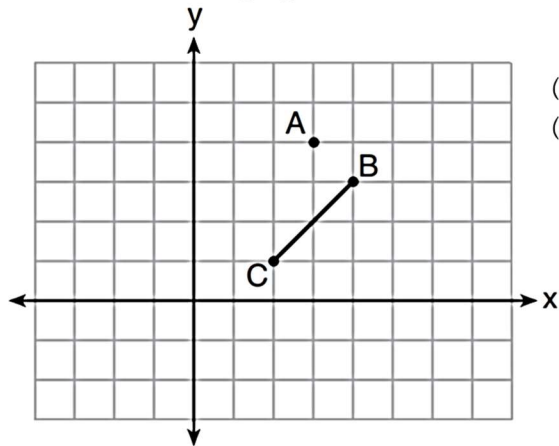
If m$\angle EGB = 50°$ and m$\angle DIG = 115°$, explain why $\overline{AB} \parallel \overline{CD}$.

DILATIONS

January 2017

13 On the graph below, point $A(3,4)$ and $\overline{BC}$ with coordinates $B(4,3)$ and $C(2,1)$ are graphed.
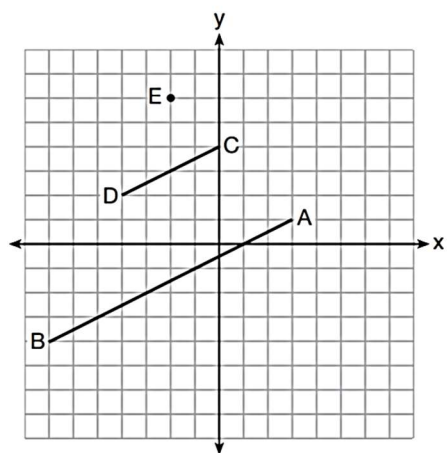

(1) $B'(5,2)$ and $C'(1,-2)$ (3) $B'(5,0)$ and $C'(1,-2)$

(2) $B'(6,1)$ and $C'(0,-1)$ (4) $B'(5,2)$ and $C'(3,0)$

What are the coordinates of B' and C' after $\overline{BC}$ undergoes a dilation centered at point A with a scale factor of 2?

August 2015

18 In the diagram below, $\overline{CD}$ is the image of $\overline{AB}$ after a dilation of scale factor k with center E.
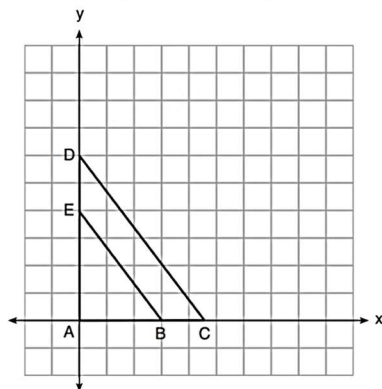

Which ratio is equal to the scale factor k of the dilation?

(1) $\dfrac{EC}{EA}$ (3) $\dfrac{EA}{BA}$

(2) $\dfrac{BA}{EA}$ (4) $\dfrac{EA}{EC}$

August 2015

23 In the diagram below, $\triangle ABE$ is the image of $\triangle ACD$ after a dilation centered at the origin. The coordinates of the vertices are $A(0,0)$, $B(3,0)$, $C(4.5,0)$, $D(0,6)$, and $E(0,4)$.
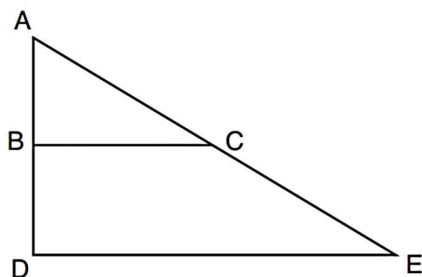
The ratio of the lengths of $\overline{BE}$ to $\overline{CD}$ is

(1) $\frac{2}{3}$

(3) $\frac{3}{4}$

(2) $\frac{3}{2}$

(4) $\frac{4}{3}$

August 2016

6 The image of $\triangle ABC$ after a dilation of scale factor k centered at point A is $\triangle ADE$, as shown in the diagram below.
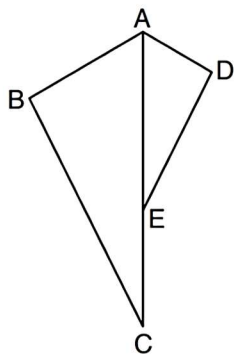
Which statement is always true?

(1) $2AB = AD$

(3) $AC = CE$

(2) $\overline{AD} \perp \overline{DE}$

(4) $\overline{BC} \parallel \overline{DE}$

January 2017

2 In the diagram below, $\triangle ADE$ is the image of $\triangle ABC$ after a reflection over the line AC followed by a dilation of scale factor $\frac{AE}{AC}$ centered at point A.

Which statement must be true?

(1) $m\angle BAC = m\angle AED$

(3) $m\angle DAE = \frac{1}{2}m\angle BAC$

(2) $m\angle ABC = m\angle ADE$

(4) $m\angle ACB = \frac{1}{2}m\angle DAB$

January 2016

31 Line ℓ is mapped onto line m by a dilation centered at the origin with a scale factor of 2. The equation of line ℓ is $3x - y = 4$. Determine and state an equation for line m.
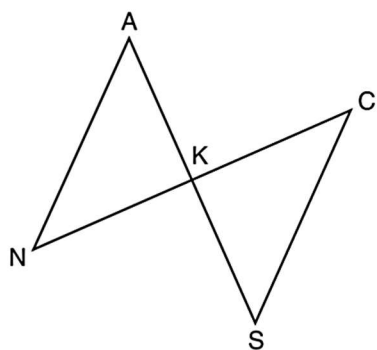
June 2018

24 Line MN is dilated by a scale factor of 2 centered at the point $(0,6)$. If $\overleftrightarrow{MN}$ is represented by $y = -3x + 6$, which equation can represent $\overleftrightarrow{M'N'}$, the image of $\overleftrightarrow{MN}$?

(1) $y = -3x + 12$

(2) $y = -3x + 6$

(3) $y = -6x + 12$

(4) $y = -6x + 6$

TRIANGLE CONGRUENCE AND PROOF

August 2018

10 In the diagram below, $\overleftrightarrow{AKS}$, $\overleftrightarrow{NKC}$, $\overline{AN}$, and $\overline{SC}$ are drawn such that $\overline{AN} \cong \overline{SC}$.

Which additional statement is sufficient to prove $\triangle KAN \cong \triangle KSC$ by AAS?

(1) $\overline{AS}$ and $\overline{NC}$ bisect each other.

(2) K is the midpoint of $\overline{NC}$.

(3) $\overline{AS} \perp \overline{CN}$

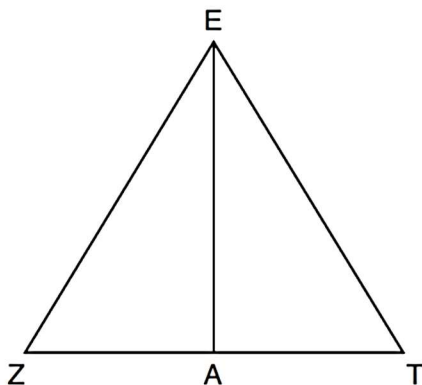(4) $\overline{AN} \parallel \overline{SC}$

June 2016

7 Two right triangles must be congruent if

(1) an acute angle in each triangle is congruent

(2) the lengths of the hypotenuses are equal

(3) the corresponding legs are congruent

(4) the areas are equal

June 2016

19 Line segment EA is the perpendicular bisector of $\overline{ZT}$, and $\overline{ZE}$ and $\overline{TE}$ are drawn.
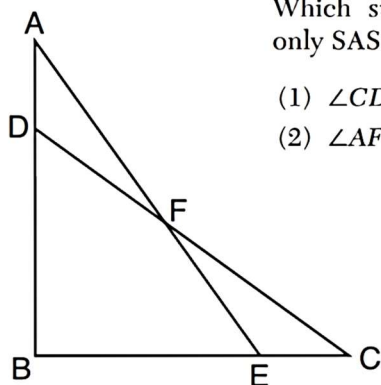

Which conclusion can *not* be proven?

(1) $\overline{EA}$ bisects angle ZET.

(2) Triangle EZT is equilateral.

(3) $\overline{EA}$ is a median of triangle EZT.

(4) Angle Z is congruent to angle T.

August 2016

22 Given: $\triangle ABE$ and $\triangle CBD$ shown in the diagram below with $\overline{DB} \cong \overline{BE}$

Which statement is needed to prove $\triangle ABE \cong \triangle CBD$ using only SAS $\cong$ SAS?
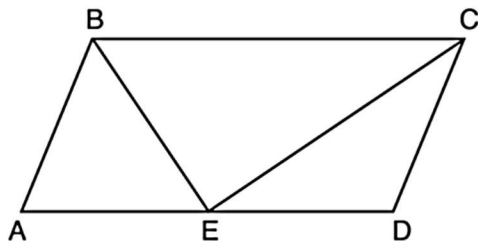
(1) $\angle CDB \cong \angle AEB$ (3) $\overline{AD} \cong \overline{CE}$

(2) $\angle AFD \cong \angle EFC$ (4) $\overline{AE} \cong \overline{CD}$

August 2018

26 In parallelogram *ABCD* shown below, the bisectors of ∠*ABC* and ∠*DCB* meet at *E*, a point on $\overline{AD}$.

If m∠*A* = 68°, determine and state m∠*BEC*.

June 2015

13 Quadrilateral *ABCD* has diagonals $\overline{AC}$ and $\overline{BD}$. Which information is *not* sufficient to prove *ABCD* is a parallelogram?

(1) $\overline{AC}$ and $\overline{BD}$ bisect each other.

(2) $\overline{AB} \cong \overline{CD}$ and $\overline{BC} \cong \overline{AD}$

(3) $\overline{AB} \cong \overline{CD}$ and $\overline{AB} \parallel \overline{CD}$

(4) $\overline{AB} \cong \overline{CD}$ and $\overline{BC} \parallel \overline{AD}$
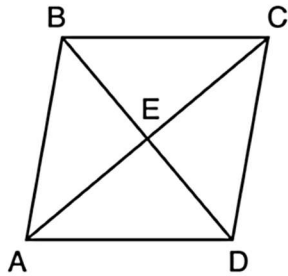
August 2015

1 A parallelogram must be a rectangle when its

(1) diagonals are perpendicular

(2) diagonals are congruent

(3) opposite sides are parallel

(4) opposite sides are congruent

June 2018

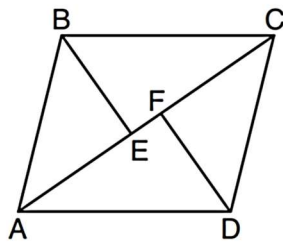**13** The diagram below shows parallelogram $ABCD$ with diagonals $\overline{AC}$ and $\overline{BD}$ intersecting at E.

What additional information is sufficient to prove that parallelogram $ABCD$ is also a rhombus?

(1) $\overline{BD}$ bisects $\overline{AC}$.

(2) $\overline{AB}$ is parallel to $\overline{CD}$.

(3) $\overline{AC}$ is congruent to $\overline{BD}$.

(4) $\overline{AC}$ is perpendicular to $\overline{BD}$.

January 2017

5 In the diagram below, if $\triangle ABE \cong \triangle CDF$ and $\overline{AEFC}$ is drawn, then it could be proven that quadrilateral $ABCD$ is a
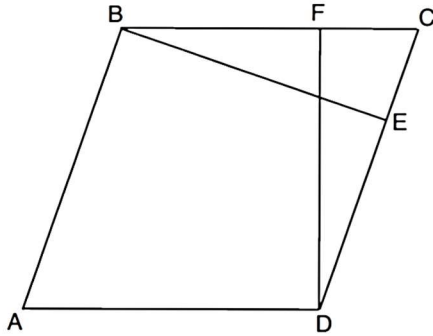

(1) square

(2) rhombus

(3) rectangle

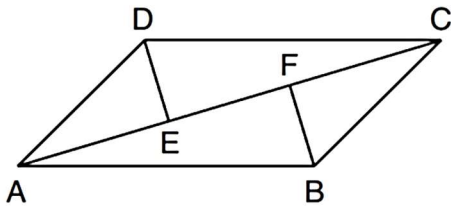(4) parallelogram

QUADRILATERAL PROOFS

August 2015

35 In the diagram of parallelogram $ABCD$ below, $\overline{BE} \perp \overline{CED}$, $\overline{DF} \perp \overline{BFC}$, and $\overline{CE} \cong \overline{CF}$.

Prove $ABCD$ is a rhombus.

January 2017

35 In quadrilateral $ABCD$, $\overline{AB} \cong \overline{CD}$, $\overline{AB} \parallel \overline{CD}$, and $\overline{BF}$ and $\overline{DE}$ are perpendicular to diagonal $\overline{AC}$ at points F and E.
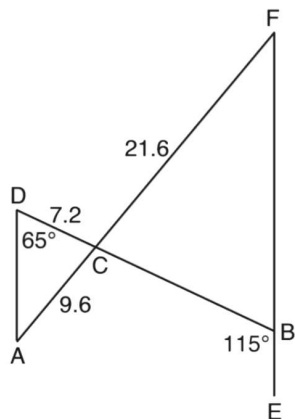

Prove: $\overline{AE} \cong \overline{CF}$

SIMILARITY

June 2018

4 In the diagram below, $\overline{AF}$ and $\overline{DB}$ intersect at C, and $\overline{AD}$ and $\overline{FBE}$ are drawn such that m∠D = 65°, m∠CBE = 115°, DC = 7.2, AC = 9.6, and FC = 21.6.

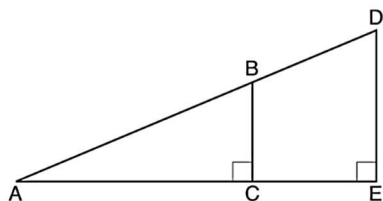F

21.6

D
7.2
65°
C
9.6

115° B

A

E

What is the length of $\overline{CB}$?

(1) 3.2

(3) 16.2

(2) 4.8

(4) 19.2

June 2018

11 In the diagram below of right triangle AED, $\overline{BC} \parallel \overline{DE}$.
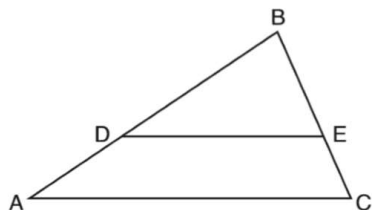
D

B

A   C   E

Which statement is always true?

(1) $\dfrac{AC}{BC} = \dfrac{DE}{AE}$

(3) $\dfrac{AC}{CE} = \dfrac{BC}{DE}$

(2) $\dfrac{AB}{AD} = \dfrac{BC}{DE}$

(4) $\dfrac{DE}{BC} = \dfrac{DB}{AB}$

August 2018

16 In triangle ABC, points D and E are on sides $\overline{AB}$ and $\overline{BC}$, respectively, such that $\overline{DE} \parallel \overline{AC}$, and AD:DB = 3:5.
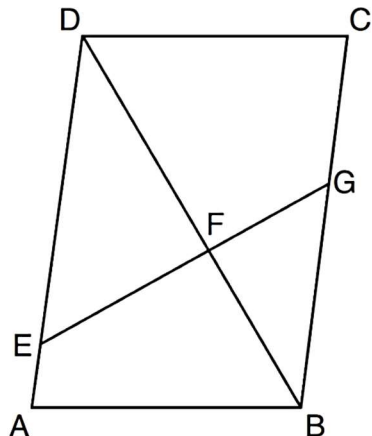
B

D   E

A   C

If DB = 6.3 and AC = 9.4, what is the length of $\overline{DE}$, to the *nearest tenth*?

(1) 3.8

(3) 5.9

(2) 5.6

(4) 15.7

June 2016

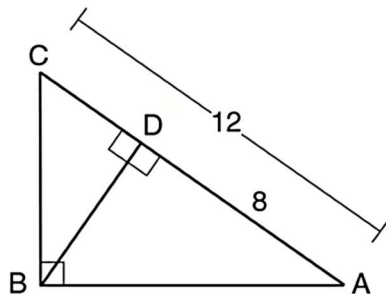**33** Given: Parallelogram $ABCD$, $\overline{EFG}$, and diagonal $\overline{DFB}$

Prove: $\triangle DEF \sim \triangle BGF$

SIMILARITY RELATED TOPICS

Right Triangle Altitude Problems

January 2018

23 In the diagram below of $\triangle ABC$, $\angle ABC$ is a right angle, $AC = 12$, $AD = 8$, and altitude $\overline{BD}$ is drawn.
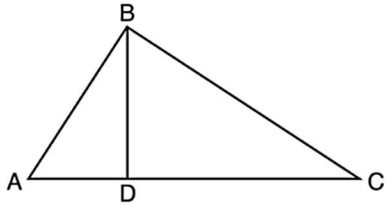

What is the length of $\overline{BC}$?

(1) $4\sqrt{2}$ (3) $4\sqrt{5}$

(2) $4\sqrt{3}$ (4) $4\sqrt{6}$

August 2018

7 In the diagram below of right triangle ABC, altitude $\overline{BD}$ is drawn to hypotenuse $\overline{AC}$.
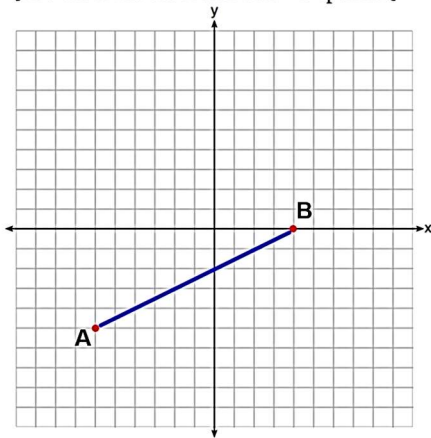

If $BD = 4$, $AD = x - 6$, and $CD = x$, what is the length of $\overline{CD}$?

(1) 5

(3) 8

(2) 2

(4) 11

Partitioning Problems
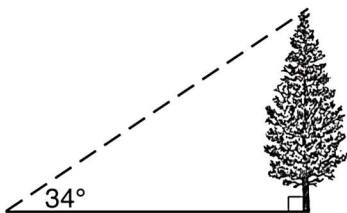
June 2015

27 The coordinates of the endpoints of $\overline{AB}$ are $A(-6, -5)$ and $B(4, 0)$. Point P is on $\overline{AB}$. Determine and state the coordinates of point P, such that $AP{:}PB$ is 2:3.
[The use of the set of axes below is optional.]

TRIGONOMETRY

June 2015

5 As shown in the diagram below, the angle of elevation from a point on the ground to the top of the tree is 34°.

If the point is 20 feet from the base of the tree, what is the height of the tree, to the *nearest tenth of a foot*?

(1) 29.7

(3) 13.5

(2) 16.6

(4) 11.2

June 2018

8 In a right triangle, the acute angles have the relationship
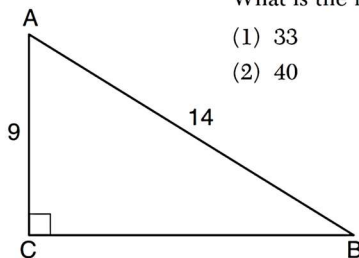
$\sin (2x + 4) = \cos (46)$.

What is the value of x?

(1) 20   (3) 24

(2) 21   (4) 25

January 2016

16 In the diagram of right triangle ABC shown below, $AB = 14$ and $AC = 9$.

What is the measure of $\angle A$, to the *nearest degree*?

(1) 33   (3) 50

(2) 40   (4) 57

June 2018

33 The map of a campground is shown below. Campsite C, first aid station F, and supply station S lie along a straight path. The path from the supply station to the tower, T, is perpendicular to the path from the supply station to the campsite. The length of path $\overline{FS}$ is 400 feet. The angle formed by path $\overline{TF}$ and path $\overline{FS}$ is 72°. The angle formed by path $\overline{TC}$ and path $\overline{CS}$ is 55°.
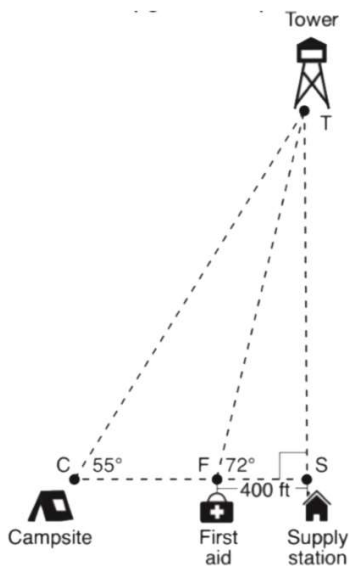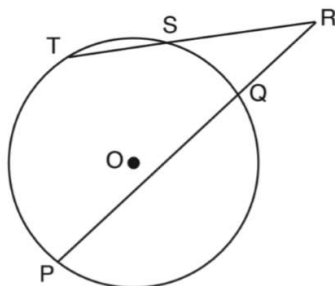
Determine and state, to the *nearest foot*, the distance from the campsite to the tower.
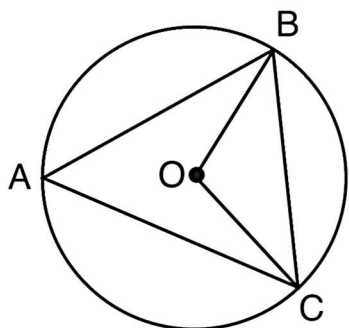
CIRCLES

June 2018

28 In the diagram below, secants $\overline{RST}$ and $\overline{RQP}$, drawn from point R, intersect circle O at S, T, Q, and P.

If $RS = 6$, $ST = 4$, and $RP = 15$, what is the length of $\overline{RQ}$?

June 2016

10 In the diagram below of circle O, $\overline{OB}$ and $\overline{OC}$ are radii, and chords $\overline{AB}$, $\overline{BC}$, and $\overline{AC}$ are drawn.
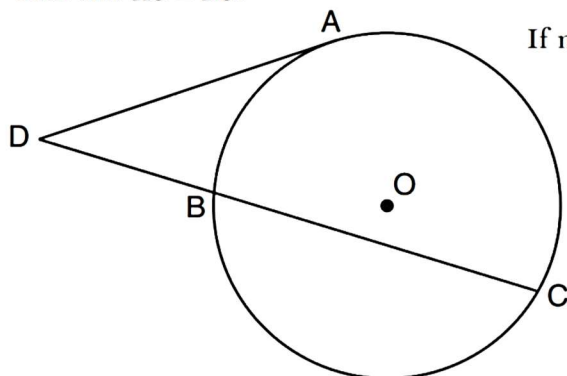

Which statement must always be true?

(1) $\angle BAC \cong \angle BOC$

(2) $m\angle BAC = \frac{1}{2}m\angle BOC$

(3) $\triangle BAC$ and $\triangle BOC$ are isosceles.

(4) The area of $\triangle BAC$ is twice the area of $\triangle BOC$.

January 2017

28 In the diagram below, tangent $\overline{DA}$ and secant $\overline{DBC}$ are drawn to circle O from external point D, such that $\overparen{AC} \cong \overparen{BC}$.

If $m\overparen{BC} = 152°$, determine and state $m\angle D$.

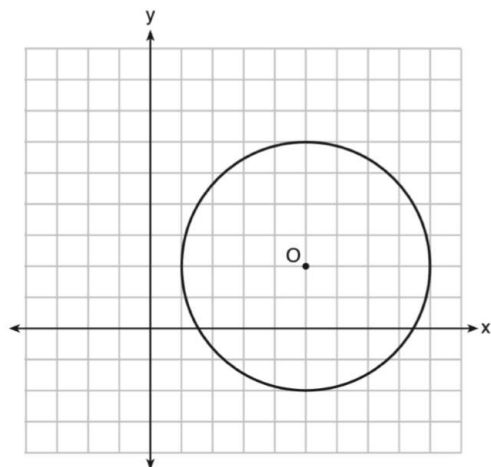## August 2015

9 If $x^2 + 4x + y^2 - 6y - 12 = 0$ is the equation of a circle, the length of the radius is

(1) 25   (3) 5

(2) 16   (4) 4

June 2018

20 What is an equation of circle O shown in the graph below?

(1) $x^2 + 10x + y^2 + 4y = -13$

(2) $x^2 - 10x + y^2 - 4y = -13$

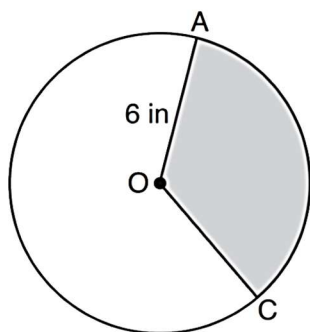(3) $x^2 + 10x + y^2 + 4y = -25$

(4) $x^2 - 10x + y^2 - 4y = -25$

June 2016

24 What is the area of a sector of a circle with a radius of 8 inches and formed by a central angle that measures 60°?

(1) $\dfrac{8\pi}{3}$ (3) $\dfrac{32\pi}{3}$

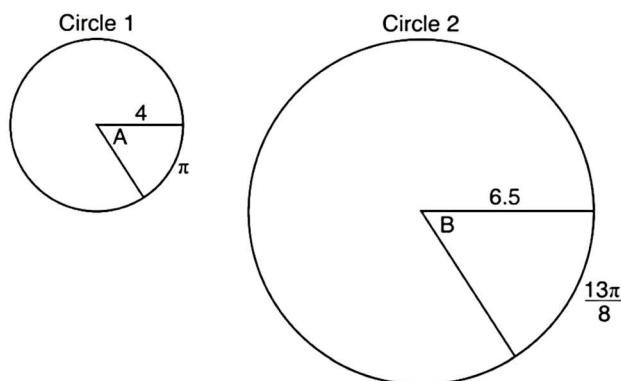(2) $\dfrac{16\pi}{3}$ (4) $\dfrac{64\pi}{3}$

June 2015

29 In the diagram below of circle O, the area of the shaded sector AOC is 12π in^2 and the length of $\overline{OA}$ is 6 inches. Determine and state m$\angle AOC$.

June 2016

29 In the diagram below, Circle 1 has radius 4, while Circle 2 has radius 6.5. Angle *A* intercepts an arc of length π, and angle *B* intercepts an arc of length $\frac{13\pi}{8}$.
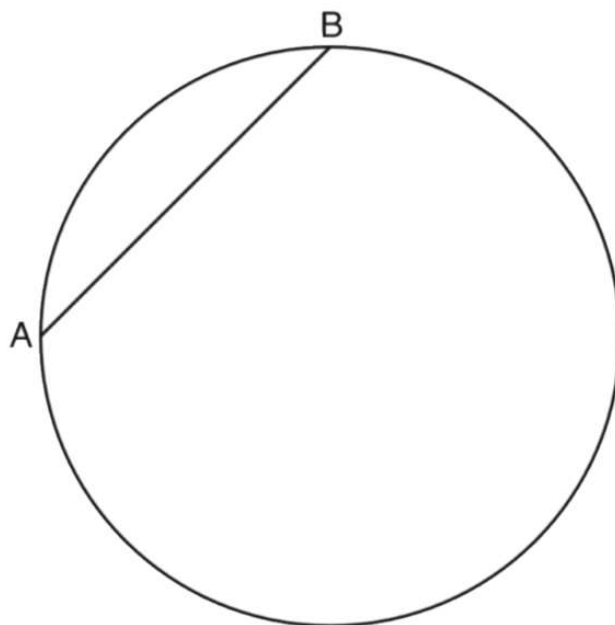

Dominic thinks that angles *A* and *B* have the same radian measure. State whether Dominic is correct or not. Explain why.
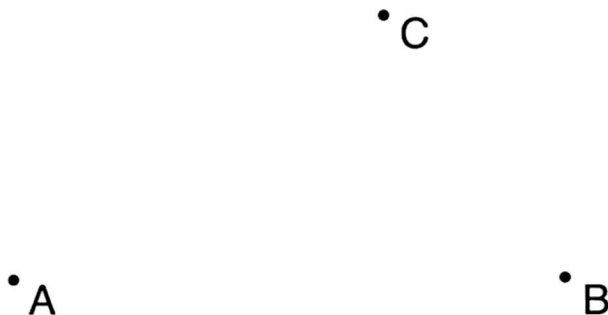
CONSTRUCTIONS

August 2018

25 In the circle below, $\overline{AB}$ is a chord. Using a compass and straightedge, construct a diameter of the circle. [Leave all construction marks.]
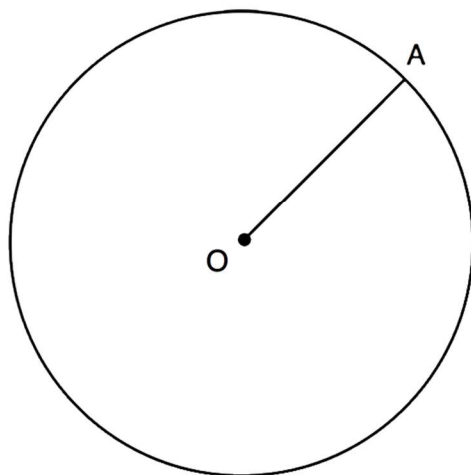
January 2019

29 Given points A, B, and C, use a compass and straightedge to construct point D so that $ABCD$ is a parallelogram.
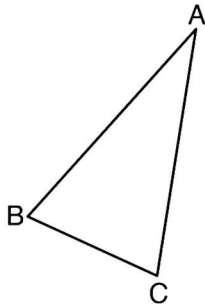
•C

•A   •B

June 2016

31 In the diagram below, radius $\overline{OA}$ is drawn in circle O. Using a compass and a straightedge, construct a line tangent to circle O at point A. [Leave all construction marks.]

August 2016

32 Using a compass and straightedge, construct and label $\triangle A'B'C'$, the image of $\triangle ABC$ after a dilation with a scale factor of 2 and centered at B. [Leave all construction marks.]

A

B

C

AREA, VOLUME, AND DENSITY

June 2018

31 Randy's basketball is in the shape of a sphere with a maximum circumference of 29.5 inches. Determine and state the volume of the basketball, to the *nearest cubic inch*.

January 2017

11 A solid metal prism has a rectangular base with sides of 4 inches and 6 inches, and a height of 4 inches. A hole in the shape of a cylinder, with a radius of 1 inch, is drilled through the entire length of the rectangular prism.
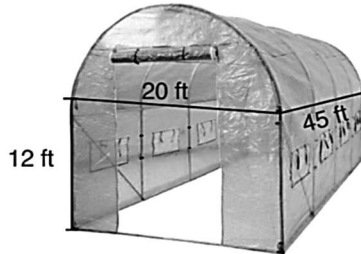
(1) 19   (3) 93

(2) 77   (4) 96

1 in.

4 in

4 in   6 in
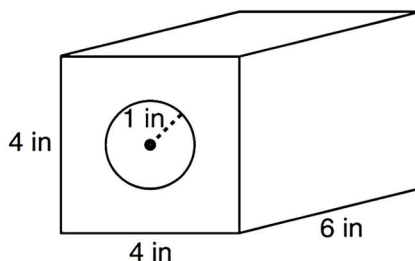
What is the approximate volume of the remaining solid, in cubic inches?

June 2018

7 The greenhouse pictured below can be modeled as a rectangular prism with a half-cylinder on top. The rectangular prism is 20 feet wide, 12 feet high, and 45 feet long. The half-cylinder has a diameter of 20 feet.

To the *nearest cubic foot*, what is the volume of the greenhouse?

(1) 17,869   (3) 39,074

(2) 24,937   (4) 67,349

June 2015

7 A shipping container is in the shape of a right rectangular prism with a length of 12 feet, a width of 8.5 feet, and a height of 4 feet. The container is completely filled with contents that weigh, on average, 0.25 pound per cubic foot. What is the weight, in pounds, of the contents in the container?

(1) 1,632   (3) 102

(2) 408   (4) 92

January 2016

30 During an experiment, the same type of bacteria is grown in two petri dishes. Petri dish *A* has a diameter of 51 mm and has approximately 40,000 bacteria after 1 hour. Petri dish *B* has a diameter of 75 mm and has approximately 72,000 bacteria after 1 hour.
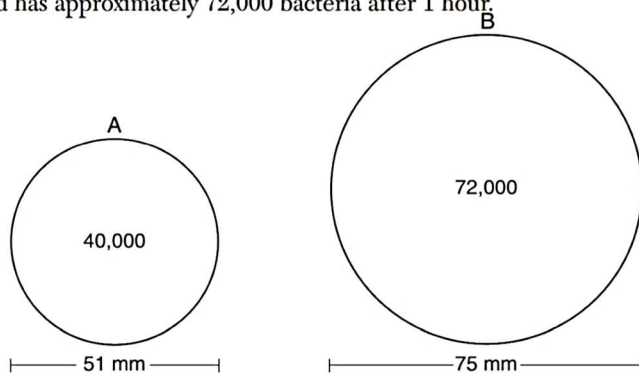
Determine and state which petri dish has the greater population density of bacteria at the end of the first hour.