Geometry Items

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Congruence
G-CO.A.1
Item 1

ITEM 1

What is the precise definition of an angle?

A. two rays that share a common endpoint

B. two line segments that share a common endpoint

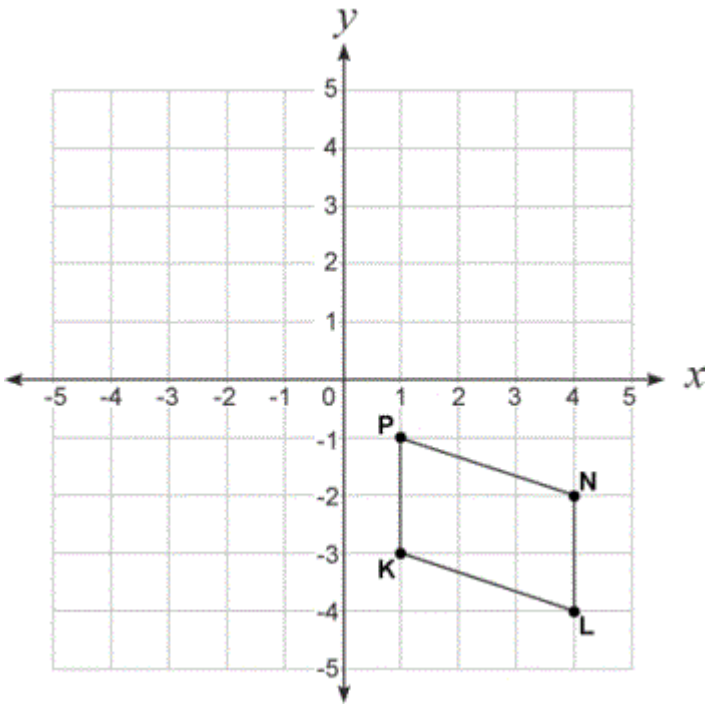
C. the measure of an arc between two intersecting lines or line segments

D. one of the four intermediate spaces formed between two intersecting lines

Congruence
G-CO.A.2
Items 2 – 9

ITEM 2

The location of point K after a translation is (-2, 3). Which rule describes this translation?



A. $(x - 3, y + 6)$

B. $(x - 6, y + 3)$

C. $(x, y + 6)$

D. $(x - 3, y)$

ITEM 3

Point A is located at (2, 1). The point is reflected over the line $y = -x$ to obtain image point A'. What are the coordinates of point A'?

A. (–1, –2)

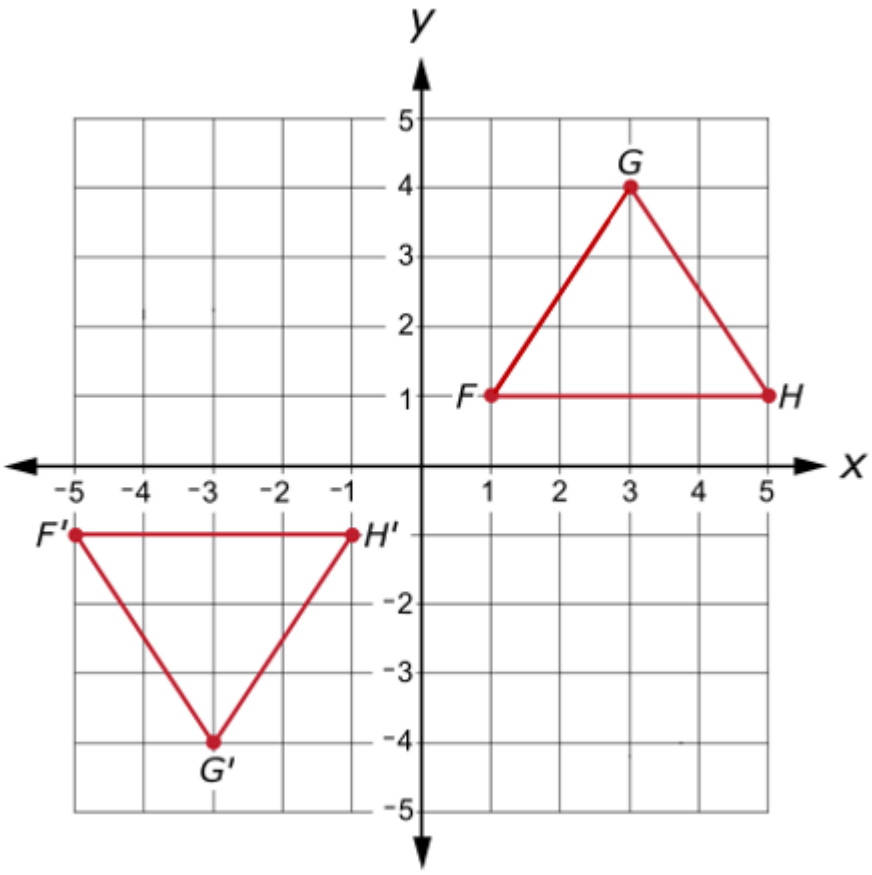
B. (–2, 1)

C. (1, 2)

D. (-2, –1)

ITEM 4

Use the graph to answer the question.



Which set of coordinates describes the transformations that map triangle *FGH* to triangle *F'G'H'*?

A. (x, y) $(x - 6, -y)$

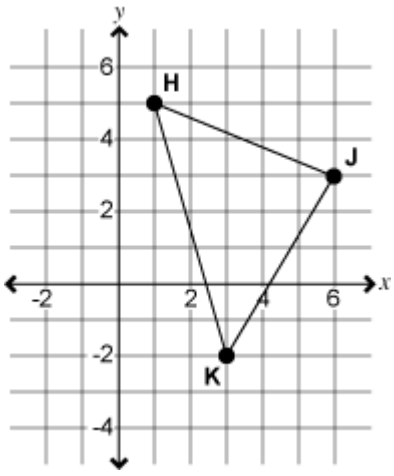
B. (x, y) $(-x, y - 2)$

C. (x, y) $(x - 6, y - 2)$

D. (x, y) $(x - 6, y - 8)$

ITEM 5

Triangle *HJK* is translated according to the rule $(x, y) \rightarrow (x - 3, y - 4)$.



What are the coordinates of vertex *H* after this translation?

A. (-3, 3)

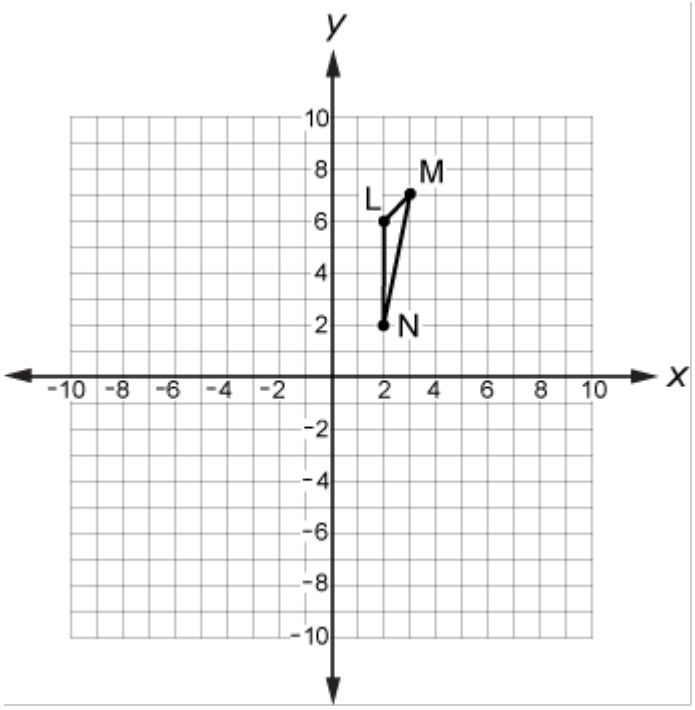
B. (-2, 1)

C. (1, -2)

D. (3, -3)

ITEM 6

Use the triangle on the grid below to answer this question.



Triangle LMN is reflected across the *x* -axis. Then it is reflected across the *y* -axis. Finally, it is translated according to the rule (*x* + 7, *y* + 3). What are the final coordinates of point M'?

A. (4, -4)

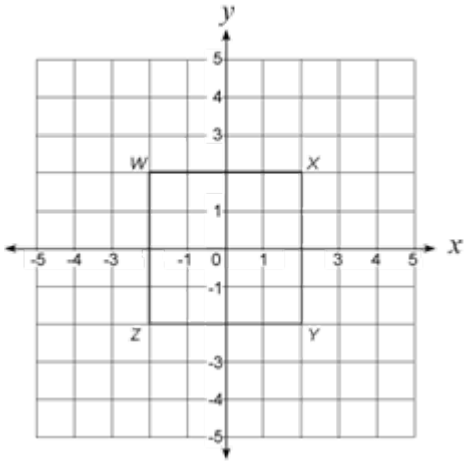
B. (-3, -7)

C. (10, 10)

D. (-10, -10)

ITEM 7

Kevin drew square WXYZ on this grid.



Kevin translated the square 3 units along the *x*- axis and -1 unit along the *y* -axis. What are the new coordinates of the square?

A. W' = (-5, 3)
X'= (-1, 3)
Y'= (-1, -1)
Z' = (-5, -1)

B. W' = (-3, 5)
X' = (1, 5)
Y' = (1, 1)
Z' = (-3, 1)

C. W' = (1, 1)
X' = (5, 1)
Y' = (5, -3)
Z' = (1, -3)

D. W' = (-1, -1)
X' = (3, -1)
Y' = (3, -5)
Z' = (-1, -5)

ITEM 8

Select all of the transformations that preserve distance and angle measures.

A. Translation

B. Stretch

C. Rotation

D. Reflection

E. Dilation

ITEM 9

Point M’ is located at (2, –1) and is the image when Point M is translated 3 units right and 2 units down and then reflected over the line x = –4. Where is Point M?

A. (–2, 3)

B. (–1, –5)

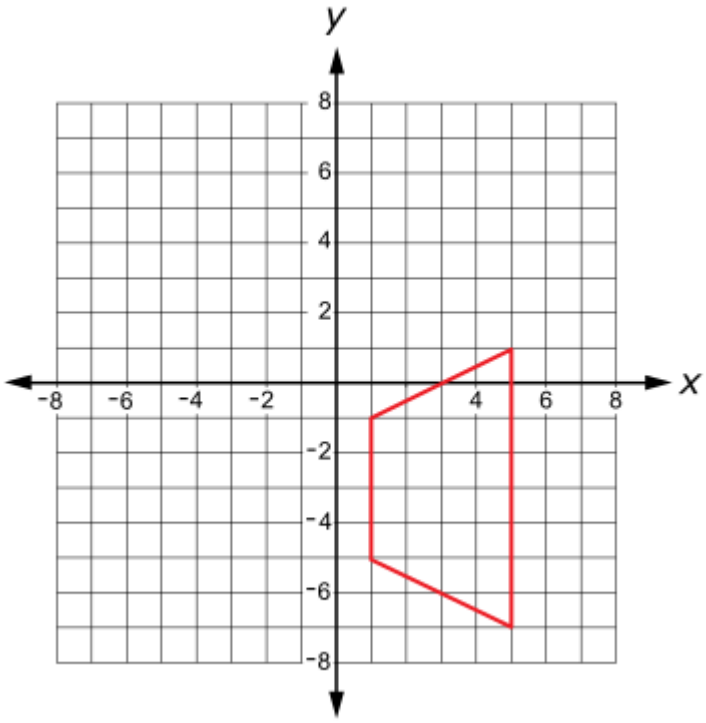
C. (–7, –3)

D. (–13, 1)

Congruence
G-CO.A.3
Items 10 – 11

ITEM 10

Use the graph to answer the question.



Which transformation carries the trapezoid onto itself?

A. reflect over the line $x = -3$

B. reflect over the line $y = -3$

C. reflect over the line $x = 3$

D. reflect over the line $y = 3$

ITEM 11

Select each shape that when reflected and rotated will carry it onto itself. Select all that apply.

A. Square

B. Rectangle

C. Parallelogram

D. Trapezoid

E. Regular Polygon

Congruence
G-CO.A.4
Items 12 – 14

ITEM 12

Lucy draws a line on a coordinate plane.

Which transformation will **always** result in a line perpendicular to Lucy's line?

A. reflect over the line $y = x$

B. rotate 270° clockwise around the origin

C. reflect over the x -axis, and then reflect over the y -axis

D. dilate by a factor of 2 with the origin as the center of dilation

ITEM 13

ΔRST is reflected to create image ΔR'S'T'.

Which statement is always true?

A. $\overline{RS} \,||\, \overline{R'S'}$

B. $\overline{RR'} \perp \overline{SS'}$

C. $\overline{RS} \perp \overline{R'S'}$

D. $\overline{RR'} \,||\, \overline{SS'}$

ITEM 14

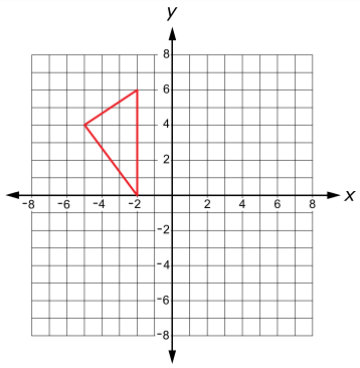
$\overline{XY}$ is reflected to create image $\overline{X'Y'}$. Which statement is always true?

A. X'X = Y'Y
B. XY = X'Y'
C. $\overline{XY} \perp \overline{XY'}$
D. $\overline{XX'} \perp \overline{YY'}$

Congruence
G-CO.A.5
Items 15 – 23

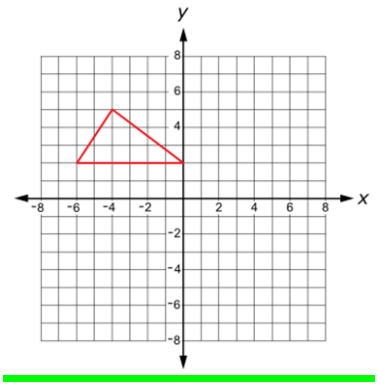
ITEM 15

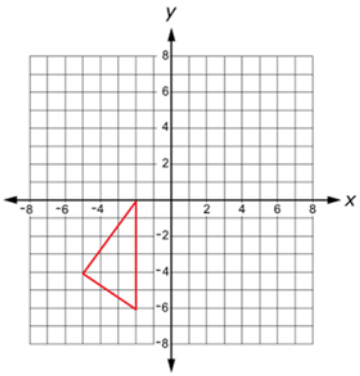
Use the graph to answer the question.

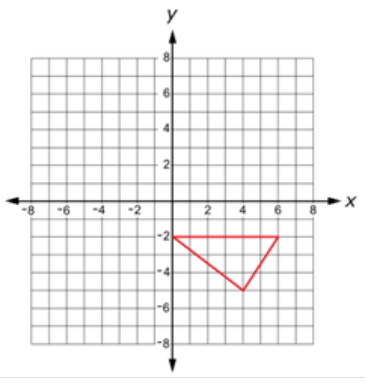


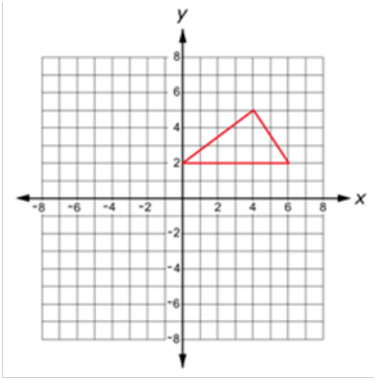
Olivia reflects the triangle over the *x* -axis, then rotates it 90° clockwise around the origin.

Which graph shows the resulting triangle?

A. 

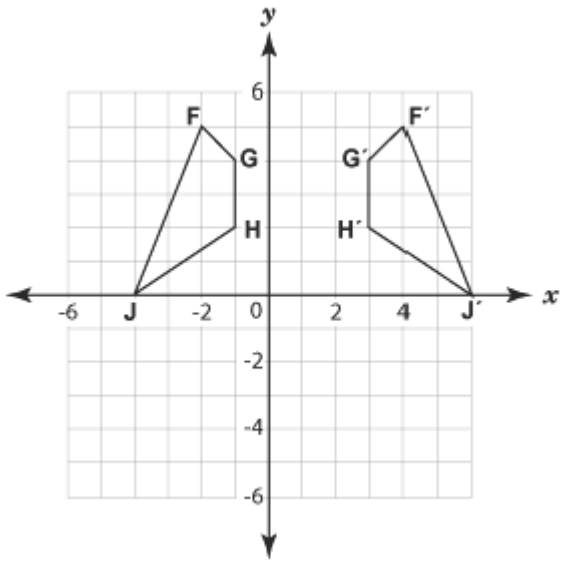
C. 

B. 

D. 

ITEM 16

Jacob transformed quadrilateral FGHJ to F'G'H'J'.



Which transformation did Jacob use?

A. reflection across the *x* –axis

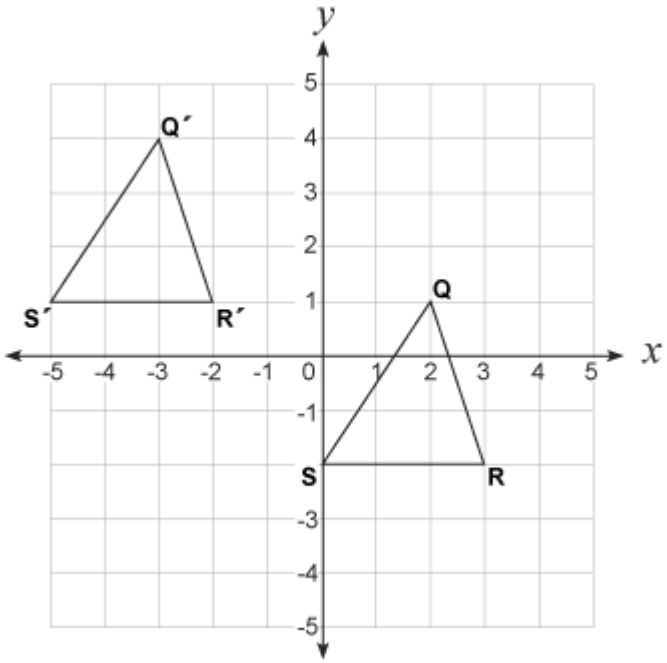
B. reflection across the *y* –axis

C. reflection across the line *x* = 1

D. reflection across the line *y* = 1

ITEM 17

Triangle Q'R'S' is a translation of triangle QRS.



Which transformation created triangle Q'R'S'?

A. translation 3 units left and 5 units up

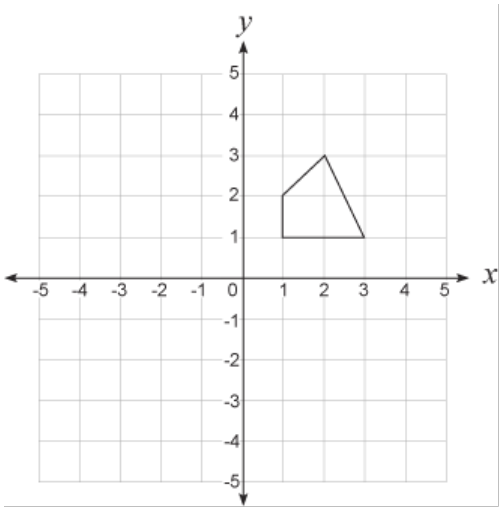
B. translation 5 units left and 3 units up

C. translation 3 units right and 5 units down

D. translation 5 units right and 3 units down

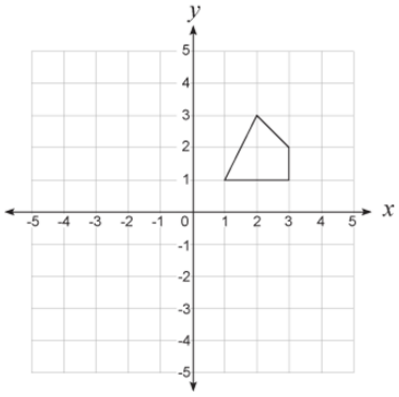
ITEM 18

Jerome reflected this figure over the line $y = 2$.

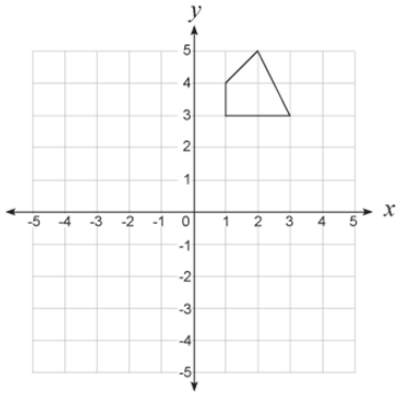


Which graph shows the result?

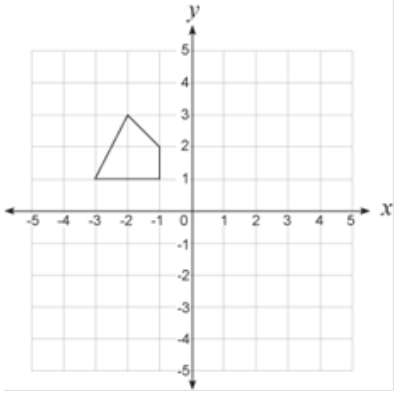
A.



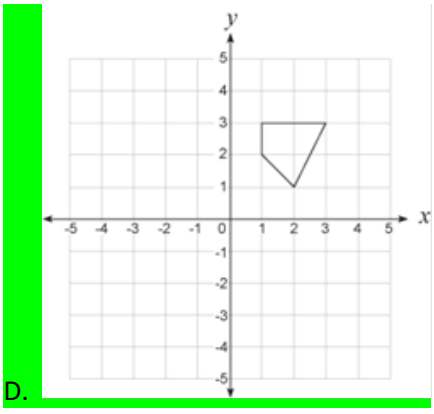
C.



B.

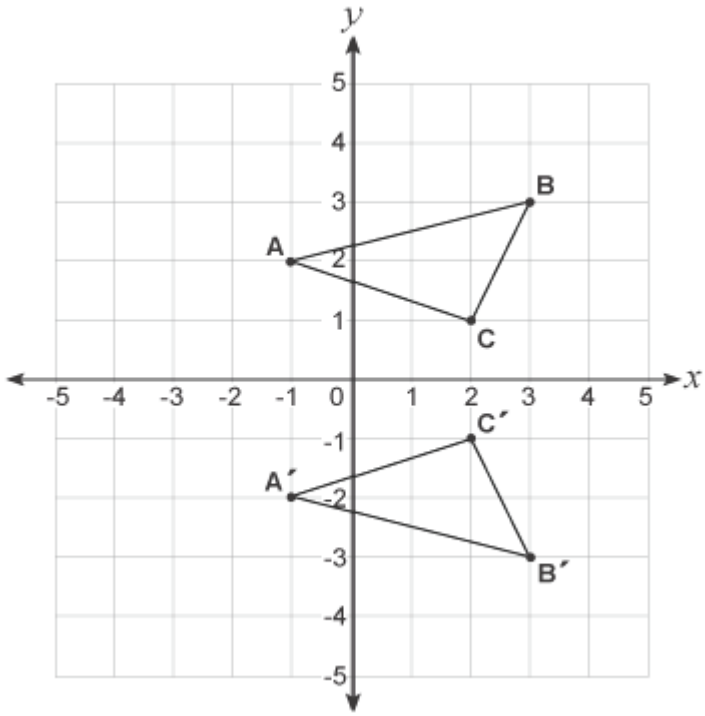


D.



ITEM 19

Bella transformed triangle ABC to make triangle A'B'C'.



Which transformation did Bella use?

A. reflection over the *x* –axis

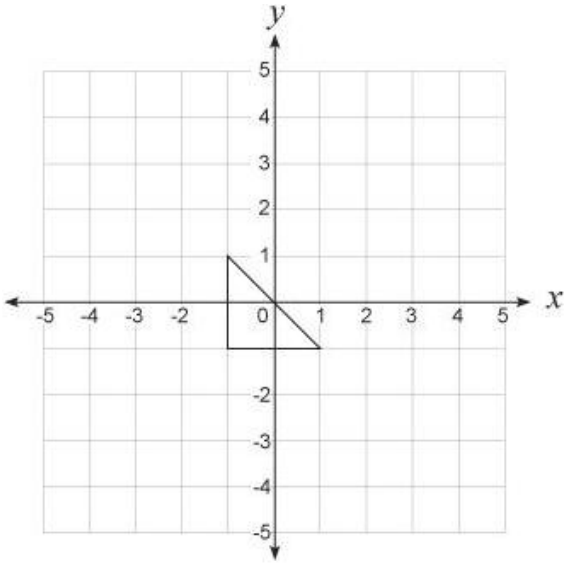
B. reflection over the *y* –axis

C. translation 2 units down

D. translation 4 units down

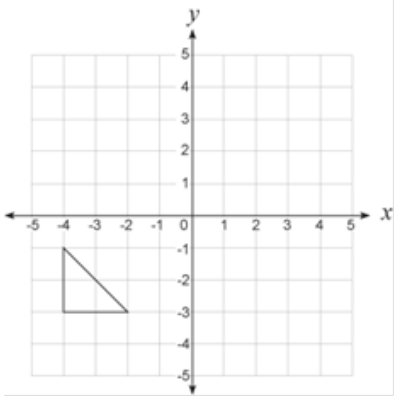
ITEM 20

Jenna translated this triangle according to the rule $(x - 3, y + 2)$.

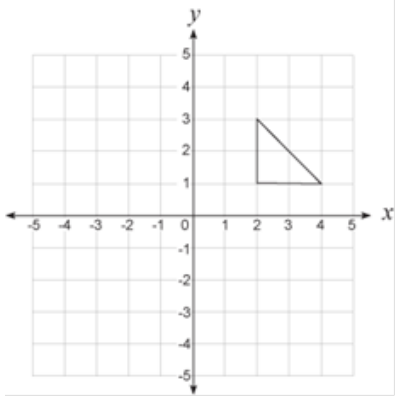


Which graph shows the result?

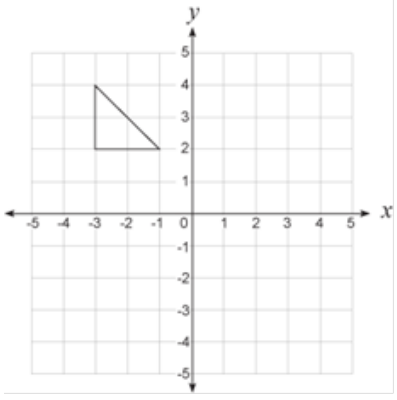
A.



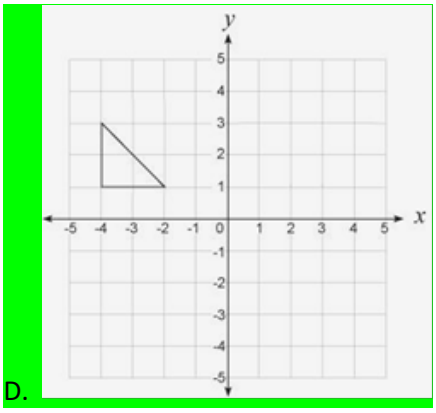
C.



B.

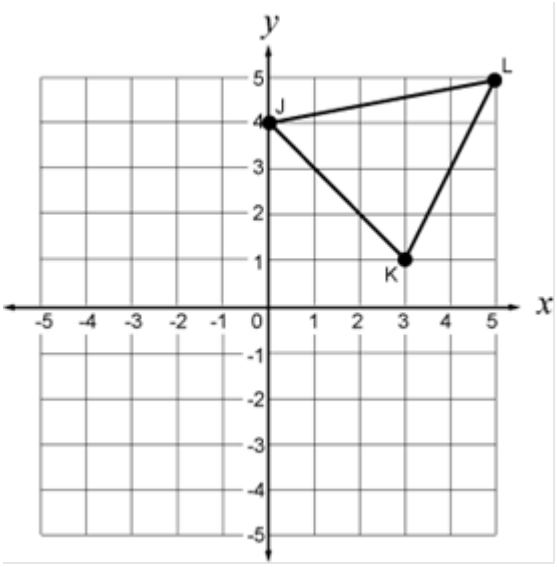


D.



ITEM 21

Triangle JKL shown below is reflected across the line $y = -2$.



What are the coordinates of vertex K' after this reflection?

A. (-7, 1)

B. (-5, 3)

C. (-3, 1)

D. (3, -5)

ITEM 22

The point (3, -2) is reflected across the line $x = 1$.

What are the coordinates of the reflected point?

A. (-3, -2)

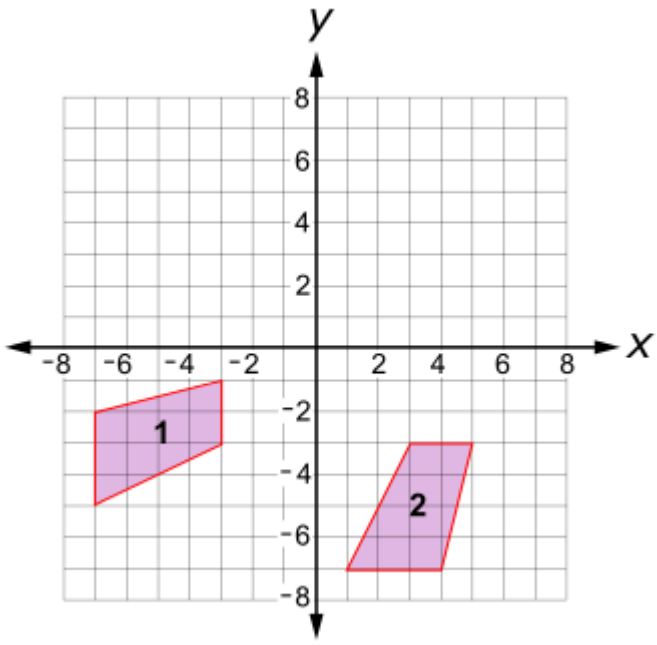
B. (-1, -2)

C. (3, 4)

D. (5, 2)

ITEM 23

Use the graph below to answer the question.



Which pair of transformations maps quadrilateral 1 exactly onto quadrilateral 2?

A. reflect it over the line $y = -3$, then rotate it 90° counterclockwise about the origin

B. reflect it over the x -axis, then rotate it 180° about the origin

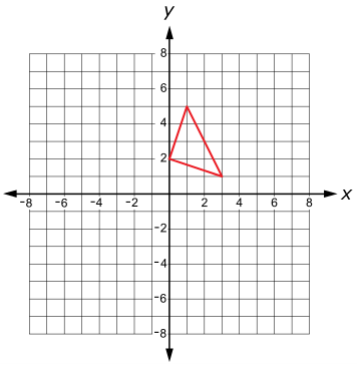
C. rotate it 90° counterclockwise about point (–3, –3), then translate it 8 units to the right

D. translate it 8 units to the right, then reflect it over the line $y = -3$

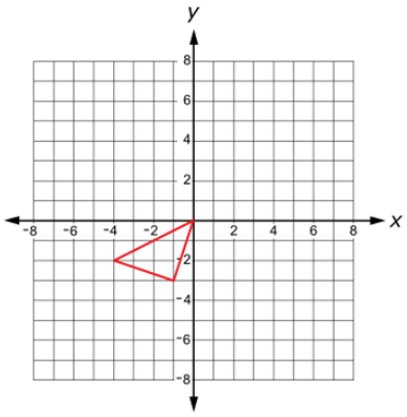
Congruence
G-CO.B.6
Items 24 – 29

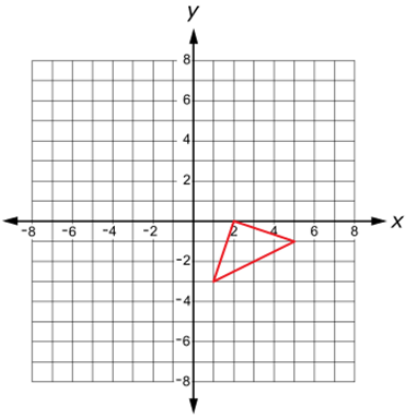
ITEM 24

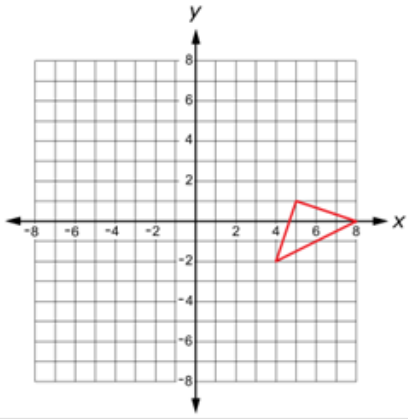
Use the graph to answer the question.

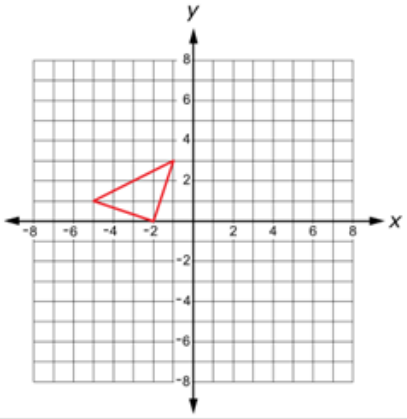


What is the result of rotating the triangle 90° counterclockwise around the point (2, -1)?

A. 

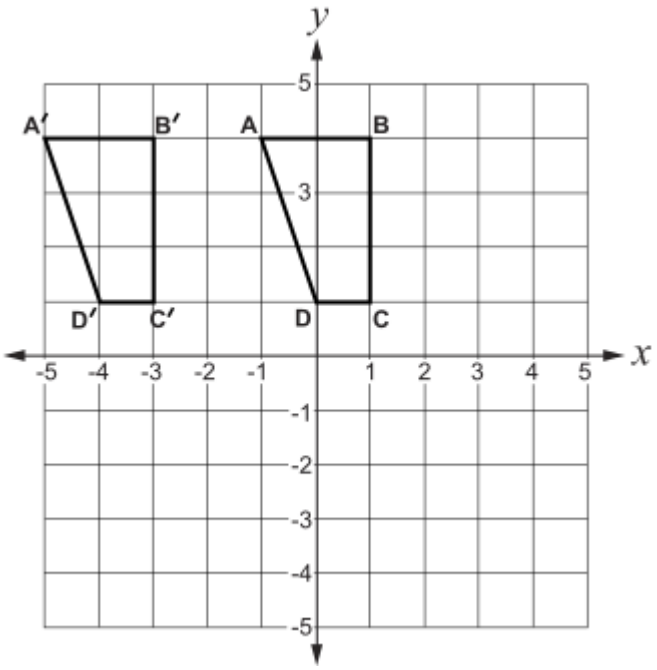
C. 

B. 

D. 

ITEM 25

Ethan transformed quadrilateral ABCD to make quadrilateral A'B'C'D'.



Are quadrilaterals ABCD and A'B'C'D' congruent? Why or why not?

A. No, they are not congruent. ABCD was translated to form A'B'C'D'.

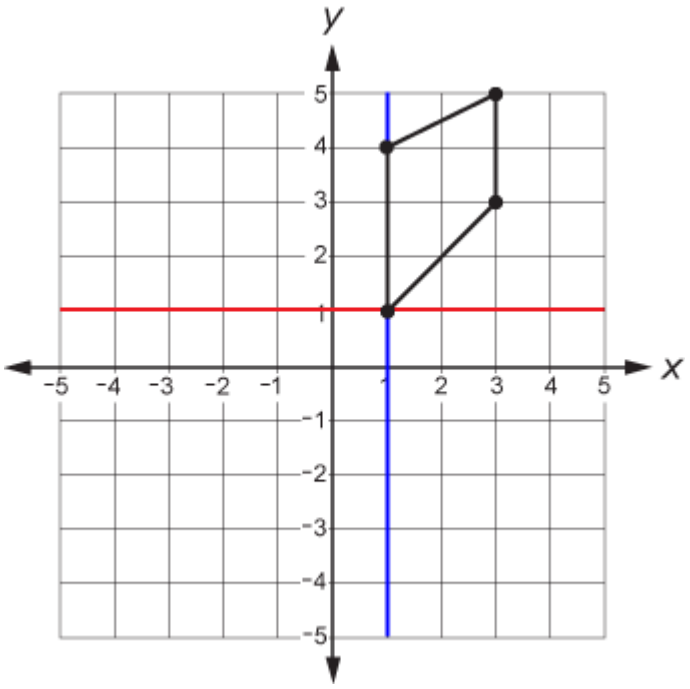
B. Yes, they are congruent. ABCD was translated to form A'B'C'D'.

C. No, they are not congruent. ABCD was reflected to form A'B'C'D'.

D. Yes, they are congruent. ABCD was reflected to form A'B'C'D'.

ITEM 26

Use the trapezoid on the grid below to answer this question.



Marvin reflected this trapezoid over a line, but only 2 of the vertices changed position. Which line could Marvin have used for the reflection?

A. x –axis

B. y –axis

C. $x = 1$ (blue line)

D. $y = 1$ (red line)

ITEM 27

ΔWXY has vertices W(3, 8), X(7, 6), and Y(5, 2).

What are the coordinates of the vertices of ΔW'X'Y' after the translation (x, y) = (x – 8, y – 10)?

A. W' (5, 2), X' (1, 2), Y' (3, 8)

B. W' (-5, -2), X' (-1, -4), Y'(-3, -8)

C. W' (11, 18), X'(15, 16), Y'(13, 12)

D. W' (-2, 5), X'(-4, -1), Y'(-8, -3)

ITEM 28

If Point B $(-5, 3)$ is the image of Point A $(5, 3)$, then the transformation was which of the following?

A. A translation of 10 units to the right.

B. A translation of 10 units down

C. A reflection across the *x*-axis.

D. A reflection across the *y*-axis

ITEM 29

Which rules represent a transformation that maps one shape onto to another to establish their congruence? Select all that apply.

A. A dilation by a scale factor of 3 about the origin.

B. A translation to the right 2 and down 6.

C. A reflection across the line y = 2.

D. A counter-clockwise rotation of 90 degrees about the origin.

E. A horizontal stretch by a factor of 2 about the origin.

Congruence
G-CO.B.7
Items 30 – 36

ITEM 30

In the two distinct acute triangles ABC and DEF, ∠B ≅ ∠E.
Triangles ABC and DEF are congruent when there is a sequence of rigid motions that maps:

A. ∠A onto ∠D, and ∠C onto ∠F

B. $\overline{AC}$ onto $\overline{DF}$ and $\overline{BC}$ onto $\overline{EF}$

C. ∠C onto ∠F and $\overline{BC}$ onto $\overline{EF}$

D. Point A onto Point D, and $\overline{AB}$ onto $\overline{DE}$

ITEM 31

Triangles JOE and SAM are drawn such that ∠E ≅ ∠M and $\overline{EJ} \cong \overline{MS}$. Which mapping would not always lead to ΔJOE ≅ ΔSAM?

A. ∠J maps onto ∠S

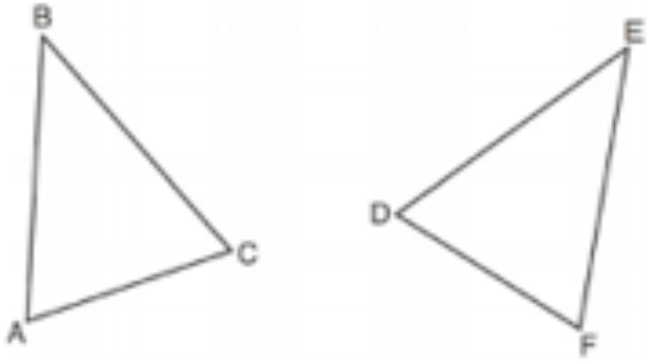
B. ∠O maps onto ∠A

C. $\overline{EO}$ maps onto $\overline{MA}$

D. $\overline{JO}$ maps onto $\overline{SA}$

ITEM 32

Which statement is sufficient evidence that triangle DEF is congruent to ABC?



A. $AB = DE$ and $BC = EF$

B. $\angle D \cong \angle A$, $\angle B \cong \angle E$, $\angle C \cong \angle F$

C. There is a sequence of rigid motions that maps segment AB onto segment DE, segment BC onto segment EF, and segment AC onto segment DF

D. There is a sequence of rigid motions that maps point A onto point D, segment AB onto segment DE, and B onto E.

ITEM 33

A triangle ABC is reflected, translated, and then rotated. If it's called ΔABC, which of the following is congruent to it?

A. ΔA'B'C'

B. ΔA'C'B'

C. ΔB'A'C'

D. ΔC'B'A'

ITEM 34

A ladder leans against a wall, forming a right triangle. If the top of the ladder slides down a little from its original resting place, is the new triangle congruent to the one before?

A. Yes, because the ladder was translated

B. Yes, because the ladder was rotated

C. No, because the angle formed by the ladder changed

D. No, because the length of the ladder changed

ITEM 35

In two distinct acute triangles ABC and DEF, ∠B ≅ ∠E. ΔABC ≅ ΔDEF are congruent when there is a sequence of rigid motions that maps which of the following?

A. ∠A onto ∠D, and ∠C onto ∠F

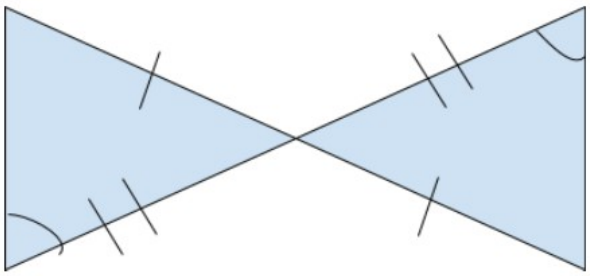
B. $\overline{AC}$ onto $\overline{DF}$ and $\overline{BC}$ onto $\overline{EF}$

C. Point A onto Point D, and $\overline{AB}$ onto $\overline{DE}$

D. ∠C onto ∠F, and $\overline{BC}$ onto $\overline{EF}$

ITEM 36

Select all triangle congruence theorems that can be used to prove the two triangles congruent.



A. AAS

B. ASA

C. AAA

D. SSS

E. SSA

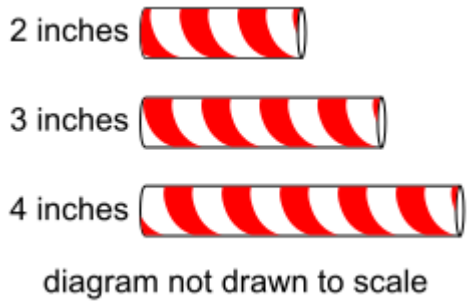
F. HL

G. SAS

Congruence
G-CO.B.8
Item 37

ITEM 37

Use the diagram to answer the question.



Zhan cut a drinking straw into three pieces (shown above) to investigate a triangle postulate. He moves the straw pieces to make triangles that have been translated, rotated, and reflected from an original position. The end of one piece is always touching the end of another piece.

Which postulate could Zhan be investigating using only these straw pieces and no other tools?

A. The sum of the measures of the interior angles of all triangles is 180°.

B. If three sides of one triangle are congruent to three sides of a second triangle, then the triangles are congruent.

C. The sum of the squares of the lengths of the two shorter sides of a triangle is equal to the square of the length of the longest side of a triangle.

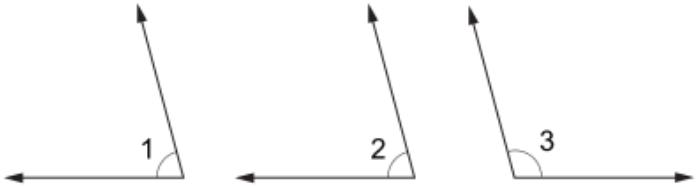
D. If two sides and the included angle of one triangle are congruent to two sides and the included angle of a second triangle, then the triangles are congruent.

Congruence
G-CO.C.9
Items 38 – 47

ITEM 38

Rosa is proving this theorem:

Angles supplementary to the same angle are congruent.



Given: $\angle 1$ and $\angle 3$ are supplementary.
$\angle 2$ and $\angle 3$ are supplementary.

Prove: $\angle 1 \cong \angle 2$

The table shows the statements and reasons for Rosa's proof, but they are out of order.

Statements	Reasons
1. $m\angle 1 + m\angle 3 = 180°$ $m\angle 2 + m\angle 3 = 180°$	1. definition of supplementary angles
2. $m\angle 1 = m\angle 2$	2. subtraction property of equality
3. $\angle 1$ and $\angle 3$ are supplementary. $\angle 2$ and $\angle 3$ are supplementary.	3. given
4. $\angle 1 \cong \angle 2$	4. definition of congruent angles
5. $m\angle 1 + m\angle 3 = m\angle 2 + m\angle 3$	5. substitution property of equality

What is the correct order for these statements and reasons?

A. 3, 1, 5, 4, 2

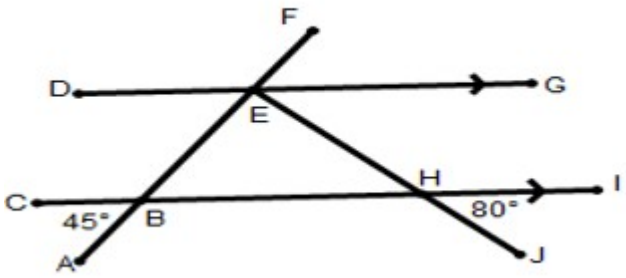
B. 3, 5, 2, 1, 4

C. 3, 1, 5, 2, 4

D. 3, 5, 1, 2, 4

ITEM 39

Use the figure below to find the measure of angle BEH.



A. 45 degrees

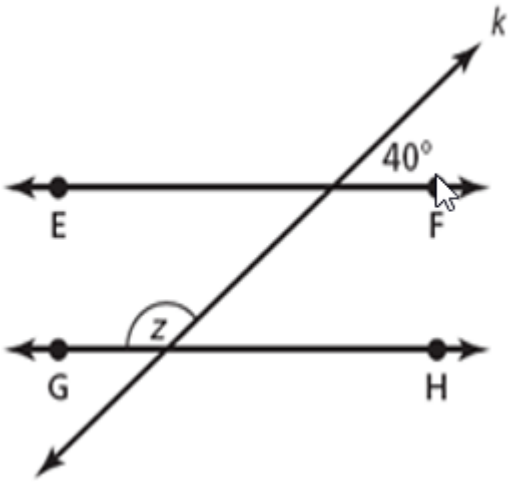
B. 55 degrees

C. 100 degrees

D. 135 degrees

ITEM 40

Use the figure below to find the measure of Angle Z. Lines EF and GH are parallel. Line k is transversal.



A. 40°

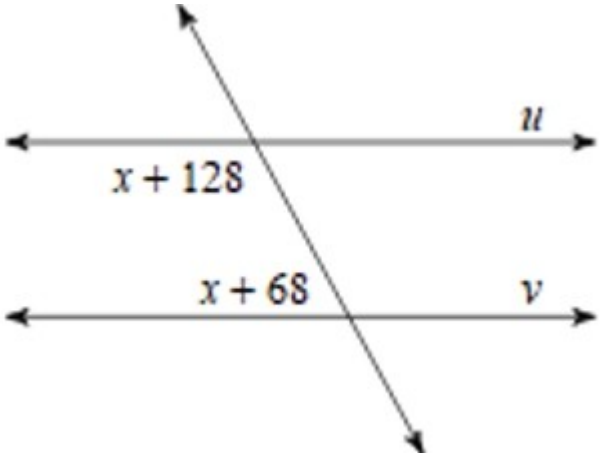
B. 50°

C. 130°

D. 140°

ITEM 41

Use the figure below to find the value of x so that lines u and v are parallel.



A. -8

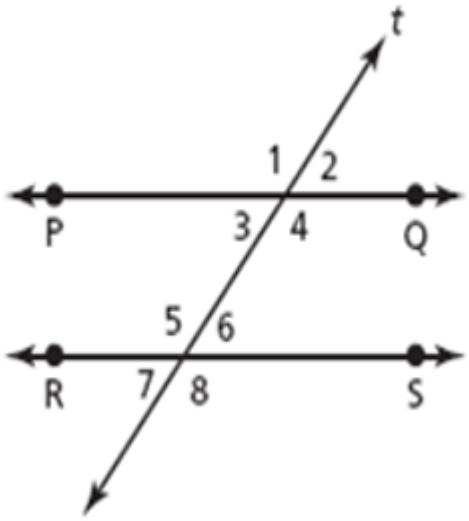
B. 5

C. 7

D. 12

ITEM 42

Use the figure below to determine which angle has the same measure as Angle 7. Lines PQ and RS are parallel. Line t is transversal.



A. $\angle 1$

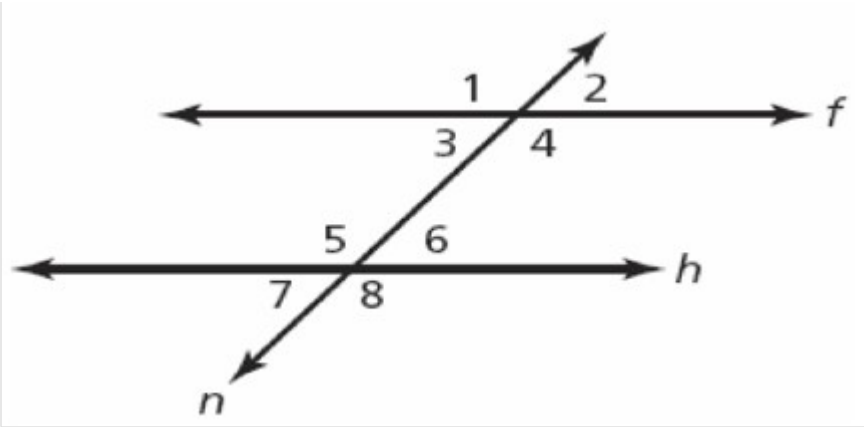
B. $\angle 3$

C. $\angle 4$

D. $\angle 5$

ITEM 43

In the diagram below, line *f* and line *h* are parallel, and line *n* is a transversal. Which term expresses the relationship between Angle 1 and Angle 8?



A. Adjacent

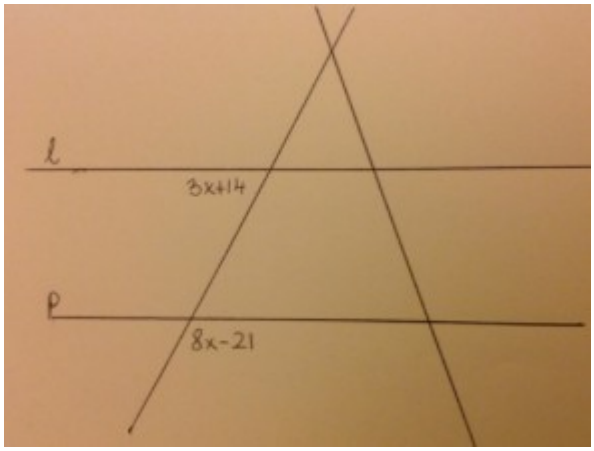
B. Complementary

C. Congruent

D. Supplementary

ITEM 44

Which equation should be used to imply that *l* and *p* parallel?



A. $3x + 14 = 8x - 21$

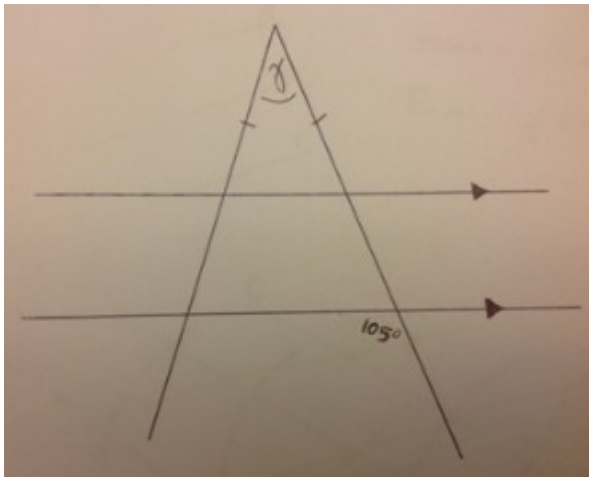
B. $2 \bullet (3x + 14) = 8x - 21$

C. $(8x - 21) - (3x + 14) = 90°$

D. $(3x + 14) + (8x - 21) = 180°$

ITEM 45

Find the value of γ.



A. 37.5 degrees

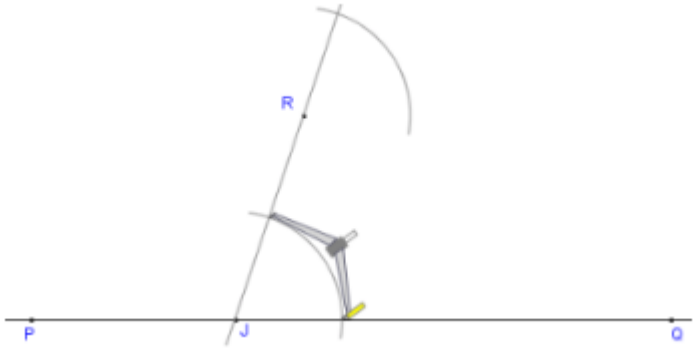
B. 52.5 degrees

C. 30 degrees

D. 105 degrees

ITEM 46

Why does the construction of a parallel line through a given point work? Which theorem, postulate, definition of construction is used?



A. Copy an angle construction.

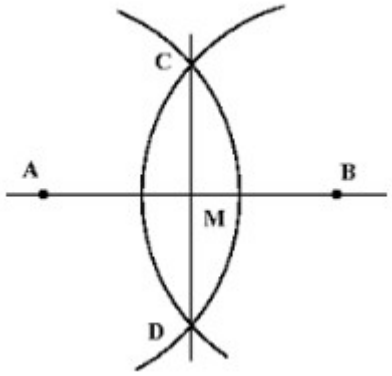
B. There is exactly one line that is going through a given point and parallel to a given line.

C. If parallel lines are cut by a transversal, then the corresponding angles are congruent.

D. If the corresponding angles are congruent, then the lines cut by a transversal are parallel.

ITEM 49

Why does the perpendicular bisector of a segment construction work? Which theorem, postulate, or definition is used?



A. There is exactly one line that is going through a given point and perpendicular to a given line.

B. Any point on the perpendicular bisector of a segment is equidistant from the endpoints of the segment.

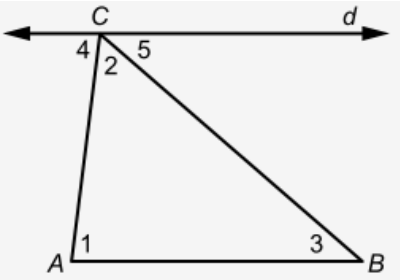
C. If a point is equidistant from the endpoints of a segment, then it's sitting on the perpendicular bisector of the segment.

D. Isosceles Triangle Definition

Congruence
G-CO.C.10
Items 48 – 58

ITEM 48

The triangle angle sum theorem states that the sum of the three interior angles of a triangle is 180 degrees. Line *d* is parallel to $\overline{AB}$ and passes through point *C*. An incomplete proof is provided below the diagram.



Given: Line *d* is parallel to $\overline{AB}$

Prove: $m\angle 1 + m\angle 2 + m\angle 3 = 180$

Statements	Reasons
1. Line *d* is parallel to $\overline{AB}$	1. Given
2. $\angle 1 \cong \angle 4$ and $\angle 3 \cong \angle 5$	2. **?**
3. $m\angle 1 = m\angle 4$ $m\angle 3 = m\angle 5$	3. Definition of congruence
4. $m\angle 4 + m\angle 2 + m\angle 5 = 180$	4. Definition of straight angle and Angle Addition Postulate
5. $m\angle 1 + m\angle 2 + m\angle 3 = 180$	5. Substitution Property of Equality

Which reason would be needed to complete this proof?

A. Corresponding angles theorem

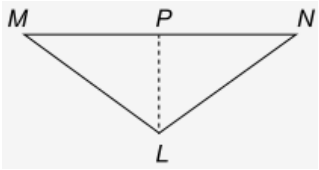
B. Same side interior angles theorem

C. Alternate exterior angles theorem

D. Alternate interior angles theorem

ITEM 49

Triangle *LMN* is an isosceles triangle with $\overline{ML}$ congruent to $\overline{NL}$. To prove that the base angles ∠M and ∠N are congruent, $\overline{LP}$ is drawn such that point *P* is the midpoint of $\overline{MN}$ as shown in the diagram below. Complete the proof.



Given: $\overline{ML} \cong \overline{NL}$ in ΔLMN
P is the midpoint of $\overline{MN}$

Prove: ∠M ≅ ∠N

Statements	Reasons
1. $\overline{ML} \cong \overline{NL}$ in $\triangle LMN$	1. Given
2. P is the midpoint of $\overline{MN}$	2. Given
3. _____ (i) _____	3. Definition of midpoint
4. _____ (ii) _____	4. Reflexive property of congruence
5. $\triangle MPL \cong \triangle NPL$	5. _____ (iii) _____
6. $\angle M \cong \angle N$	6. Congruent parts of congruent triangles are congruent

A.
i) $\angle MPL \cong \angle NPL$
ii) $\angle MLP \cong \angle NLP$
iii) AAS postulate of triangle congruence

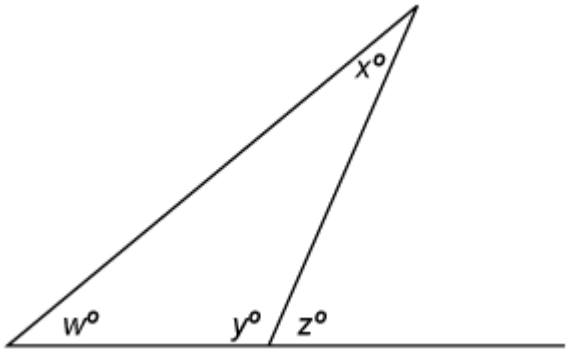
B.
i) $\overline{MP} \cong \overline{NP}$
ii) $\angle M \cong \angle N$
iii) SAS theorem of triangle congruence

C.
i) $\angle MPL \cong \angle NPL$
ii) $\overline{PL} \cong \overline{PL}$
iii) SAS theorem of triangle congruence

D.
i) $\overline{MP} \cong \overline{NP}$
ii) $\overline{PL} \cong \overline{PL}$
iii) SSS theorem of triangle congruence

ITEM 50

Darnelle drew this figure and the accompanying equations.



$w + x + y = 180$
$y + z = 180$

Which equation **must** also be true?

A. $w + z = 180$

B. $y - x = w$

C. $w + x + z = 180$

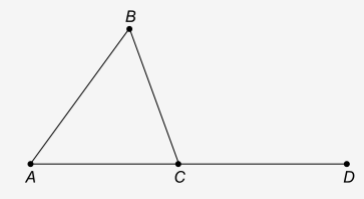
D. $w + x = z$

ITEM 51

Ethan is proving the Exterior Angle Theorem, which states that the measure of an exterior angle of a triangle is equal to the sum of the measures of the two remote interior angles.

Given: Triangle *ABC* on line segment *AD*

Prove: m ∠*A* + m ∠*B* = m ∠*BCD*



	Statement		Reason
	ABC on line segment AD		Given
	m∠*A* + m∠*B* + m∠*BCA* = 180°		Angle Sum Theorem
	∠*BCA* and ∠*BCD* form a linear pair		Definition of a linear pair
	∠*BCA* and ∠*BCD* are supplementary		If two angles form a linear pair, then they are supplementary
	?		Definition of supplementary angles
	m∠*A* + m∠*B* + m∠*BCA* = m∠*BCA* + m∠*BCD*		Substitution property of equality
	m∠*A* + m∠*B* = m∠*BCD*		Subtraction property of equality

What statement should Ethan add at Step 5 to complete the proof?

A. m∠*BCA* = m∠*BCD*

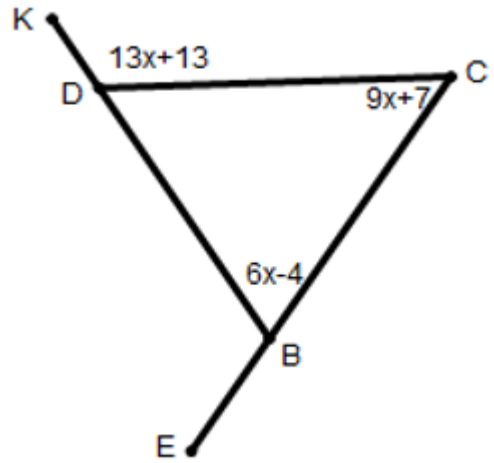
B. m∠*BCA* < m∠*BCD*

C. m∠*BCA* + m∠*BCD* = 90°

D. m∠*BCA* + m∠*BCD* = 180°

ITEM 52

Use the figure below to find the measure of Angle KDC.



A. 5°

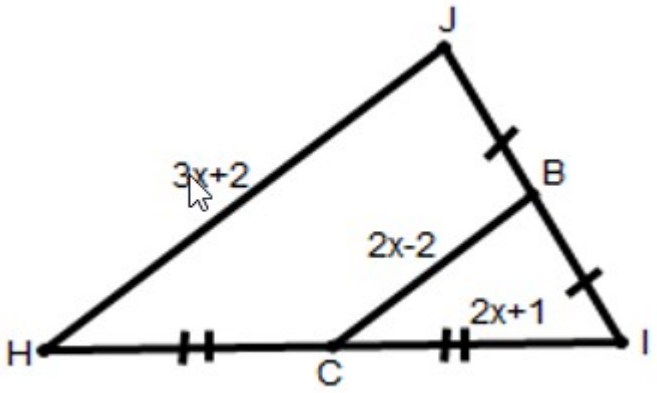
B. 26°

C. 52°

D. 78°

ITEM 53

Use the figure below to find *BC.*



A. 6 units

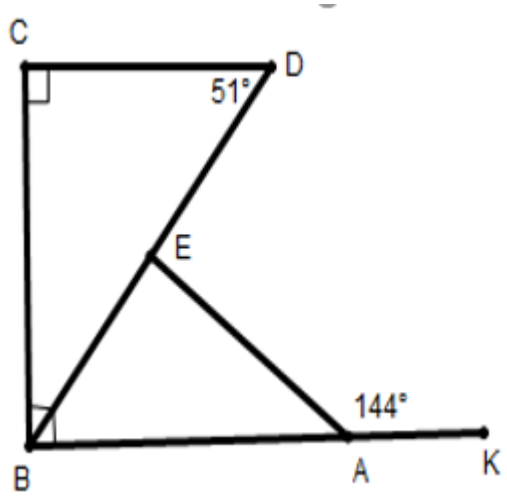
B. 10 units

C. 13 units

D. 14 units

ITEM 54

Use the figure below to find m∠DEA



A. 87°

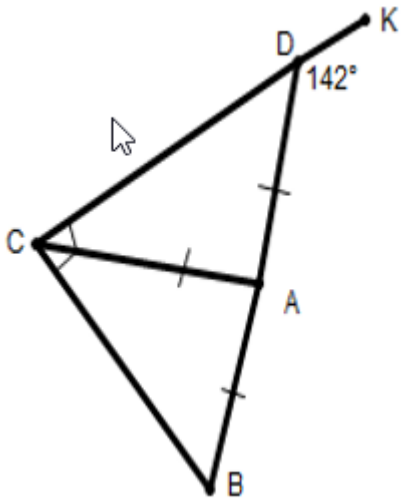
B. 93°

C. 99°

D. 123°

ITEM 55

Use the figure below to find m∠BAC.



A. 38°

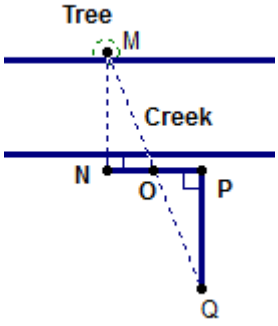
B. 52°

C. 76°

D. 104°

ITEM 56

Andre wanted to measure the width of a creek by his camp but cannot get to the other side of the creek. Andre decided to construct two triangles to determine the width of the creek indirectly. Sighting the position of a tree on the opposite bank of the creek and placing 4 wooden pegs at point N, O, P, and Q as shown in the figure, such that $\overline{MN} \perp \overline{NP}$, $\overline{NP} \perp \overline{PQ}$, and O is the midpoint of $\overline{NP}$. Andre claims that ΔMNO and ΔQPO are congruent.



Part A

Provide a valid argument, using geometry theorems or postulates, to validate Andre's claim that $\triangle MNO$ and $\triangle QPO$ are congruent **.**

_____

_____

_____

Part B

Which segment should Andre measure to determine the width of the creek? Explain why.

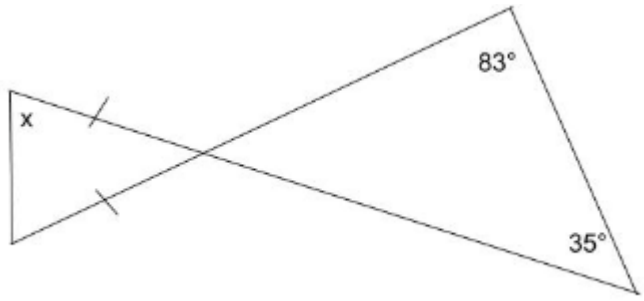
_____

_____

_____

ITEM 57

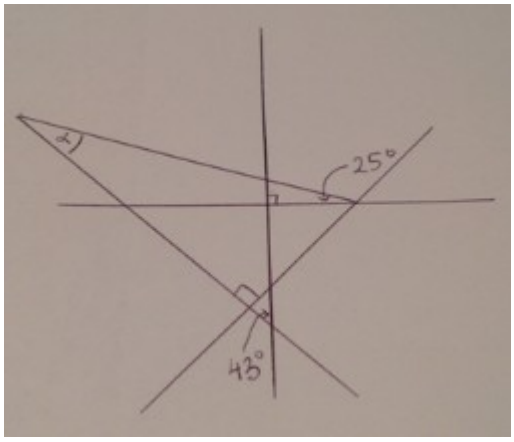
Determine the value of x in the diagram below. The diagram is not drawn to scale.



_59 or 59.0____

ITEM 58

Determine the measure of α.



A. 22 degrees

B. 25 degrees

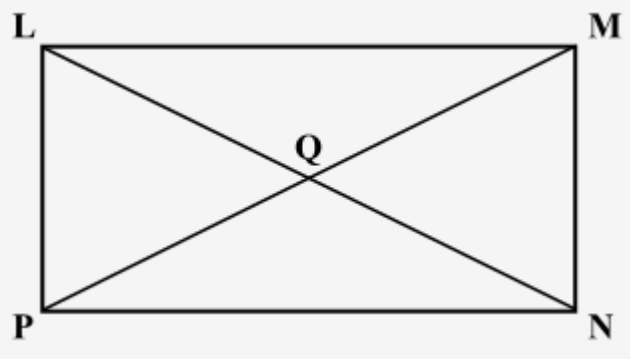
C. 43 degrees

D. 47 degrees

Congruence
G-CO.C.11
Items 59 – 68

ITEM 59

The diagonals of rectangle LMNP intersect at point Q.



Which method would be **best** to use to prove that the diagonals bisect each other?

A. LNM NLP by ASA

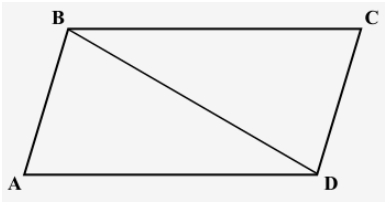
B. LNM NLP by SSS

C. LMQ NPQ by ASA

D. LQP NQM by SSS

ITEM 60

Quadrilateral ABCD is a parallelogram. Segment BD is a diagonal of the parallelogram. An incomplete proof is provided below the diagram.



Given: Parallelogram ABCD

Prove: A is congruent to C.

Statements	Reasons
1) Parallelogram **ABCD**	1) Given
2) $\overline{BC} \parallel \overline{DA}$, $\overline{AB} \parallel \overline{DC}$	2) Definition of parallelogram
3) _____ (?) _____	3) _____ (?) _____
4) $\overline{BD} \cong \overline{BD}$	4) Reflexive property of congruence
5) $\triangle ABD \cong \triangle CDB$	5) ASA theorem of triangle congruence
6) $\angle A \cong \angle C$	6) Congruent parts of congruent triangles are congruent

Which statement and reason correctly complete this proof?

A. Statement: $\angle CBD \cong \angle ADB$ and $\angle CDB \cong \angle ABD$
Reason: Alternate interior angles theorem

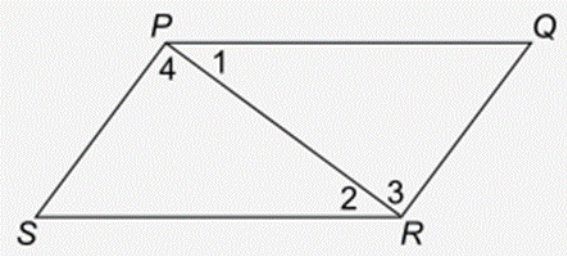
B. Statement: $\angle CBD \cong \angle ADB$ and $\overline{BC} \cong \overline{DA}$
Reason: definition of parallelogram

C. Statement: $\overline{AB} \cong \overline{CD}$ and $\overline{BC} \cong \overline{DA}$
Reason: definition of parallelogram

D. None of the above would properly complete the proof.

ITEM 61

Noah is writing a proof to show that opposite sides of parallelograms are congruent. Given: *PQRS* is a parallelogram.



Prove: $\overline{PQ} \cong \overline{RS}, \overline{PS} \cong \overline{RQ}$

Statements	Reasons
1. *PQRS* is a parallelogram.	1. given
2. $\overline{PQ} \parallel \overline{RS}, \overline{PS} \parallel \overline{RQ}$	2. definition of parallelogram
3. $\angle 1 \cong \angle 2, \angle 3 \cong \angle 4$	3. Alternate interior angles are congruent.
4. ?	4. Congruence of segments is reflexive.
5. $\Delta QRP \cong \Delta SPR$	5. ASA–Angle Side Angle theorem
6. $\overline{PQ} \cong \overline{RS}, \overline{PS} \cong \overline{RQ}$	6. Corresponding parts of congruent triangles are congruent.

Which statement should Noah add at step 4?

A. $\angle S \cong \angle Q$

B. $\overline{RP} \cong \overline{RP}$

C. $\angle 1 \cong \angle 3, \angle 2 \cong \angle 4$

D. $\overline{PQ} \cong \overline{RS}, \overline{PS} \cong \overline{RQ}$

ITEM 62

The diagonals of a parallelograms must have which characteristic?

A. Congruent

B. Parallel

C. Perpendicular

D. Bisect each other

ITEM 63

In parallelogram *ABCD*, $AC = DB$, $m\angle ABC = 2xy$, and $m\angle BCD = 9x + 9$. Find the value of y.

A. 9

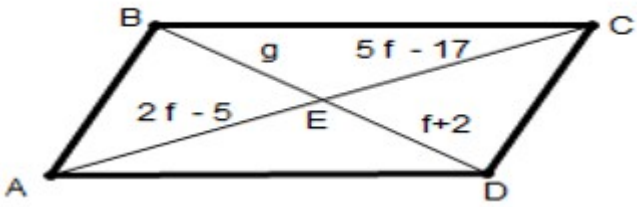
B. 5

C. 18

D. 10

ITEM 64

In parallelogram ABCD, the measure of $BE = g$, $ED = f + 2$, $AE = 2f - 5$, and *EC = 5f - 7*. Find BE.



A. $\frac{22}{7}$ units

B. 5 units

C. $\frac{36}{7}$ units

D. 6 units

ITEM 65

In parallelogram ABCD, the measure of angle *A* is $(3x - 15)°$ and the measure of angle *C* is $(2x + 10)°$. Find the value of x.

A. 5

B. 25

C. 35

D. 41

ITEM 66

In quadrilateral ABCD, the measure of angle *A* is $(x - 10)^{\circ}$ while the measure of angle *B* is $(x + 10)^{\circ}$. For what value x of will quadrilateral ABCD be a parallelogram?

A. x can represent any real number.

B. There is no real number that can be represented by x.

C. 80

D. 90

ITEM 67

Point E is the intersection of the diagonals of a parallelogram ABCD. Which of the following statements is **not** necessarily true?

A. AB = DC

B. AC = BD

C. AE = CE

D. DE = BE

ITEM 68

From the list below, select **all** of the characteristics of a parallelogram.

A. Diagonals bisect each other.

B. Diagonals are angle bisectors.

C. Opposite angles are congruent.

D. Opposite sides are congruent.

E. Opposite angles are supplementary.

F. Opposite sides are parallel.

G. Consecutive angles are supplementary.

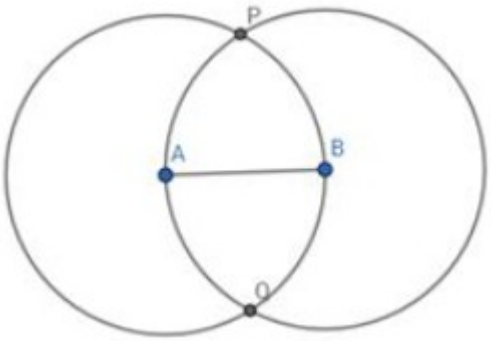
H. Diagonals are perpendicular.

I. Diagonals are congruent.

Congruence
G-CO.D.12
Items 69 – 73

ITEM 69

What specific construction has been made when line segment PQ is drawn?



A. Perpendicular Bisector

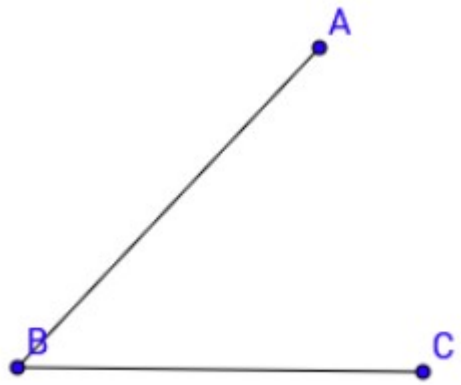
B. Chord

C. Perpendicular segment

D. Midpoint

ITEM 70

Terry is trying to bisect acute angle ABC. He begins by placing the point of the compass at point B.



Select the **two** remaining steps for Terry to bisect the angle

A. Draw an arc across each leg whereby both arcs are of equal radii

B. Measure the angle size

C. From where each arc crosses the legs, make an arc in the angle's interior

D. Draw a circle around point C, so that all points are equidistant

ITEM 71

Liam wishes to draw a line segment congruent to line segment AB shown.

He has all of the equipment listed on his desk, which should he use? Select the **two** most appropriate choices.

A. Compass

B. Ruler

C. Straight edge

D. Protractor

E. None of the above

ITEM 72

Allie is finding a specific point on a line segment. She follows these steps:

1. Make arcs using a compass, above and below the approximate location of the midpoint from both ends of the segment.
2. Connect the points of intersection of the arcs with a straight edge.

The point at which this new segment intersects the original line segment is called the:

A. Perpendicular Bisector

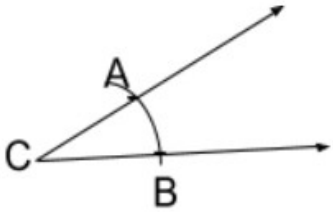
B. Median

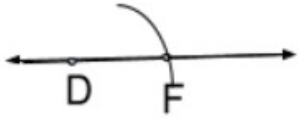
C. Midpoint

D. Quartile

ITEM 73

Marquel is constructing an angle congruent to ∠ACB. First two steps are shown below.





Which is the third step in the construction?

A. Use the compass to measure the distance from D to F.

B. Use the compass to measure the distance from B to A.

C. Extend the line through D and F so that its length is equal to the length of the line through C and B.

D. Draw a line from D, with the same length with the same length as the line through C and A, which intersects the arc

Congruence
G-CO.D.13
Items 74 – 77

ITEM 74

The directions for a construction are shown below:

1. Create a circle with the center at point A
2. Create a circle with the center at point B such that circle B is congruent to circle A and circle B passes through point A.
3. Using a straightedge draw a line segment between the centers of the two circles.
4. Using a straightedge draw a line segment between point A and one of the intersection points of the two circles. Label this intersection point C.
5. Using a straightedge draw a line segment between point B and point C.

Which of the following would be true for the constructed figure?

A. The constructed figure is equilateral triangle ABC inscribed in a circle.

B. The constructed figure is right isosceles triangle ABC not inscribed in a circle.

C. The constructed figure is right scalene triangle ABC inscribed in a circle.

D. The constructed figure is equilateral triangle ABC not inscribed in a circle.

ITEM 75

To construct an equilateral triangle inscribed in a circle, two congruent circles are created such that the center of each circle is also a point on the other circle. Which of the following would **not** represent directions to construct the sides of the equilateral triangle?

A. Using a straightedge draw a line segment between the two intersection points of the two circles.

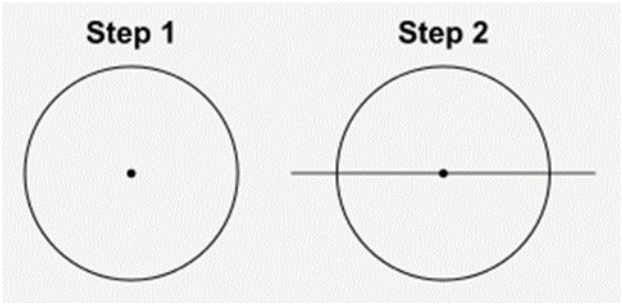
B. Using a straightedge draw a line segment between the endpoint of the diameter of the circle that is not also the radius of the second circle and the upper point of intersection of the two circles.

C. Using a straightedge draw a line segment between the top intersection point of the two circles and the radius of the first circle.

D. Using a straightedge draw a line segment between the endpoint of the diameter of the circle that is not also the radius of the second circle and the bottom point of intersection of the two circles.

ITEM 76

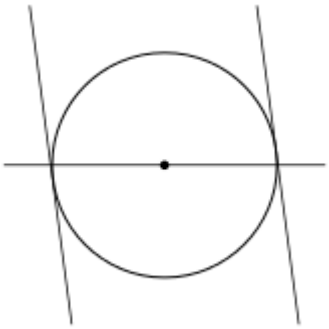
Use the diagram to answer the question.



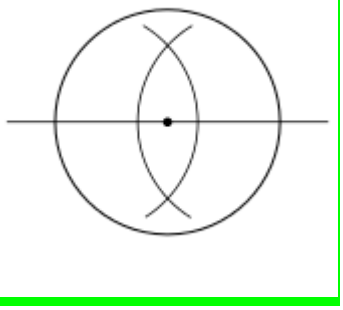
Daya is drawing a square inscribed in a circle using a compass and a straightedge. Her first two steps are shown.

Which is the **best** step for Daya to do next?

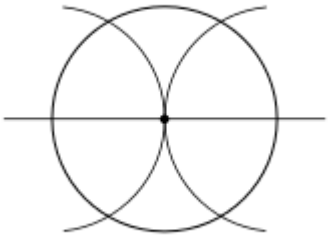
A.



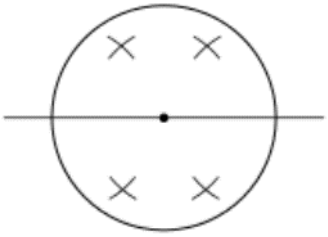
C.



B.



D.



ITEM 77

The directions for constructing a figure inscribed in a circle are given below:

1. Given a circle, create a diameter.
2. Construct a perpendicular bisector of the diameter.
3. Draw line segments between the adjacent points on the circle generated by construction of the diameter and the perpendicular bisector.

Select the figure that would be constructed using these directions.

A. equilateral triangle

B. regular hexagon

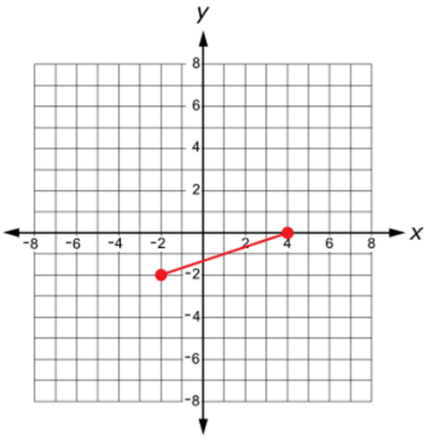
C. right triangle

D. square

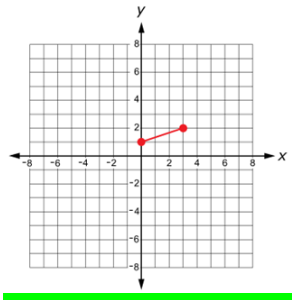
Similarity, Right Triangles, and Trigonometry
G-SRT.A.1
Items 78 – 80

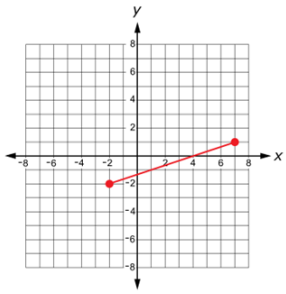
ITEM 78

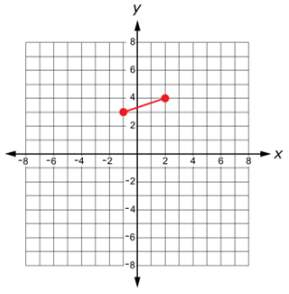
Use the graph to answer the question.

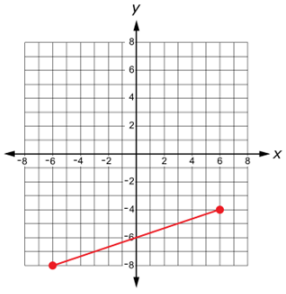


Which graph shows the line segment pictured above after it has been dilated by a scale factor of $\frac{1}{2}$ with a center of dilation of (2, 4)?

A.


C.


B.


D.


ITEM 79

The coordinates for the endpoints of Segment AB are A (1, 3) and B (5, 0). Segment AB is dilated by a scale factor of 3 with the origin as the center of dilation to create Segment A' B'. Which of the following will be the slope of Segment A' B'?

A. $\frac{3}{4}$

B. $\frac{4}{3}$

C. $-\frac{3}{4}$

D. Slope of Segment A' B' cannot be determined from the information provided.

ITEM 80

The coordinates for the endpoints of LM are L (-2, -3) and M (4, 5). LM is dilated by a scale factor of (1/ 2) from center of dilation (3, -2) to form Segment L'M'. Which statement is **not** true?

A. Segment L'M' is parallel to Segment LM.

B. The length of Segment L'M' is twice the length of Segment LM.

C. The length of Segment L'M' is one-half the length of Segment LM.

D. The slope of Segment L'M' is the same as the slope of Segment LM.

Similarity, Right Triangles, and Trigonometry
G-SRT.A.1b
Item 81

ITEM 81

Apply a dilation with a scale factor of 3 to triangle ABC. Let the image be triangle A'B'C'. Which one of the following equations is true?

A. $m\angle A = 3(m\angle A')$

B. $m\angle A' = 3(m\angle A)$

C. $AB = 3(A'B')$

D. $A'B' = 3(AB)$

Similarity, Right Triangles, and Trigonometry
G-SRT.A.2
Items 82 – 87

ITEM 82

Caleb draws triangle ABC on the coordinate grid. Then he transforms triangle ABC, producing triangle A'B'C'. Triangles ABC and A'B'C' are similar, but not congruent.

Which transformation of triangle ABC could produce this result?

A. dilate by a factor of 3

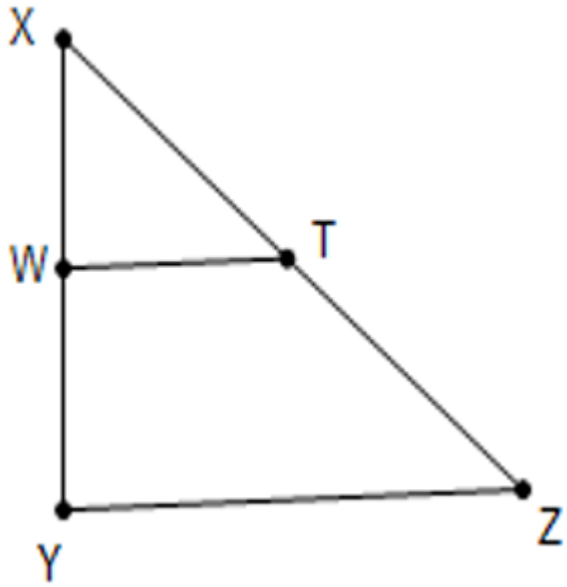
B. reflect over the line $y = x$

C. rotate 180° around the origin

D. stretch vertically by a factor of 3

ITEM 83

In the figure below, ΔXYZ is the image of ΔXWT after a dilation of scale factor K centered at X. Which of the following statements about this transformation is always true?



A. 2XW = XY

B. $\overline{XY} \perp \overline{YZ}$

C. XT = $\frac{1}{2}$TZ

D. $\overline{WT} \parallel \overline{YZ}$

ITEM 84

$\Delta X'Y'Z'$ is the image of ΔXYZ after a dilation transformation by a scale of 2. Which statement is true?

A. $YZ = Y'Z'$

B. $XY = 2(X'Y')$

C. $m\angle Y = m\angle Y'$

D. $m\angle Z = \frac{1}{2}(m\angle Z')$

ITEM 85

If $\triangle XYZ$ is dilated by a scale factor of 3 with the center of dilation at the origin, which statement is true of image $\triangle X'Y'Z'$?

A. $3X'Y' = XY$

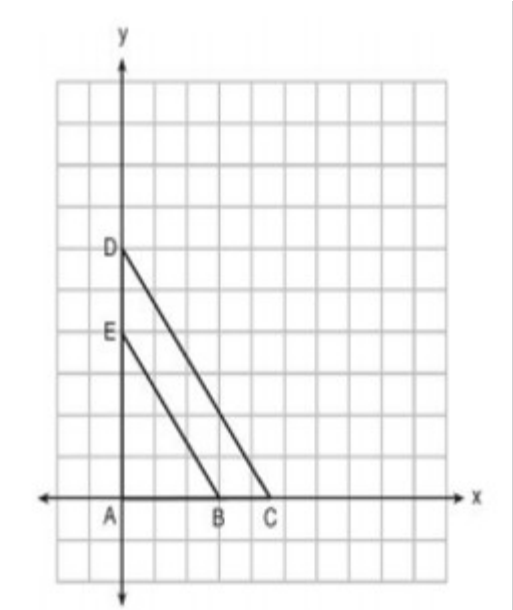
B. $X'Y' = 3XY$

C. $m\angle Y' = 3(m\angle Y)$

D. $3(m\angle Y') = m\angle Y$

ITEM 86

In the figure below, ΔABE is the image of ΔACD 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 which of the following?



A. 2:3

B. 3:2

C. 3:4

D. 4:3

ITEM 87

$\triangle RJM$ has an area of 6 square units and perimeter of 12 units. If the triangle is dilated by a scale factor of 3 centered at the origin, what are the area and perimeter of its image, triangle *R'J'M'*?

A. area of 9 square units and perimeter of 15 units

B. area of 18 square units and perimeter of 36 units

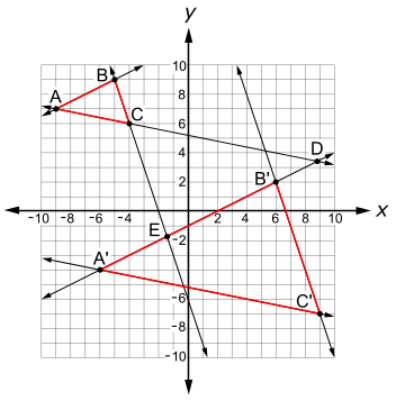
C. area of 54 square units and perimeter of 36 units

D. area of 54 square units and perimeter of 108 units

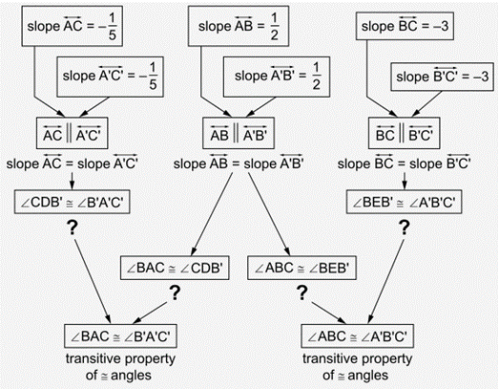
Similarity, Right Triangles, and Trigonometry
G-SRT.A.3
Items 88 – 93

ITEM 88

Use the graph and flow chart to answer the question.



Kamal dilates triangle ABC to get triangle A'B'C'. He knows that the triangles are similar because of the definition of similarity transformations. He wants to demonstrate the angle-angle similarity postulate by proving ∠BAC ≅ ∠B'A'C' and ∠ABC ≅ ∠A'B'C'. Kamal makes this incomplete flow chart proof.



What reason should Kamal add at all of the question marks in order to complete the proof?

A. Two non-vertical lines have the same slope if and only if they are parallel.

B. Angles supplementary to the same angle or to congruent angles are congruent.

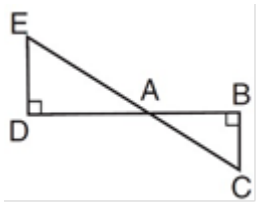
C. If two parallel lines are cut by a transversal, then each pair of corresponding angles is congruent.

D. If two parallel lines are cut by a transversal, then each pair of alternate interior angles is congruent.

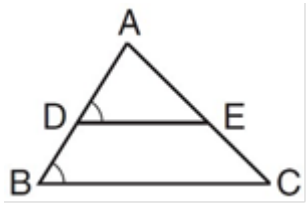
ITEM 89

Which of the following figures does **not** represent the statement $\triangle ABC \sim \triangle ADE$?

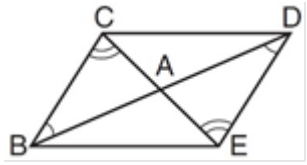
A. **Figure A**



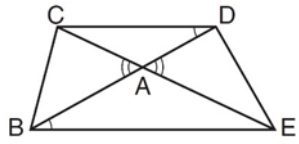
B. **Figure B**



C. **Figure C**

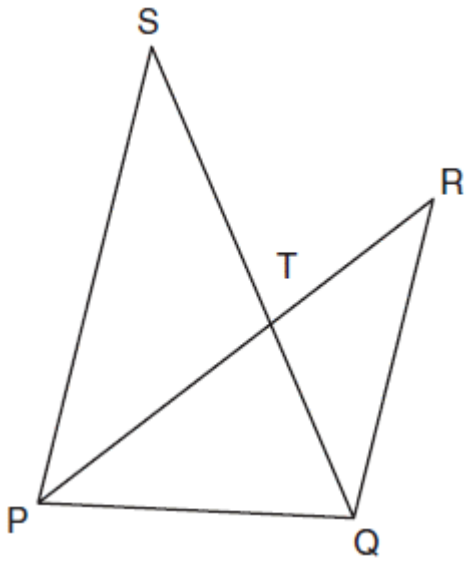


D. **Figure D**



ITEM 90

In the figure below, $\overline{PS} \parallel \overline{QR}$. What technique can be used to prove $\triangle PST \sim \triangle RQT$?



A. SAS

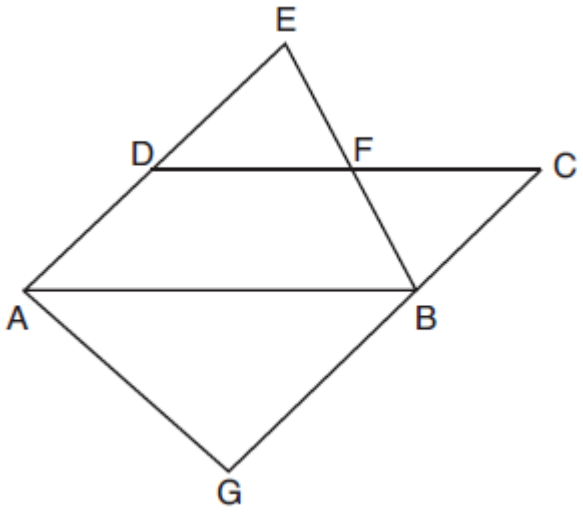
B. AA

C. SSS

D. HL

ITEM 91

In the figure below $\overline{AB} \,||\, \overline{DC}$ and $\overline{EA} \,||\, \overline{CG}$. Which of the following statements is always true?



A. $\Delta DEF \cong \Delta CBF$

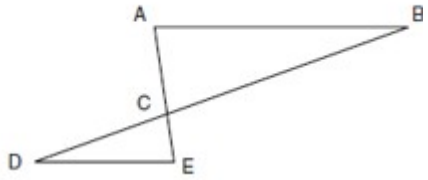
B. $\Delta BAG \cong \Delta BAE$

C. $\Delta BAG \sim \Delta AEB$

D. $\Delta DEF \sim \Delta AEB$

ITEM 92

In the figure below $\angle CAB \cong \angle CED$. Which method can be used to show $\triangle ABC \sim \triangle EDC$?



A. SAS

B. AA

C. SSS

D. HL

ITEM 93

Given ΔABC and ΔDEF such that $\frac{AC}{DF} = \frac{CB}{FE}$. Which additional information would prove ΔABC ~ ΔDEF?

A. AC = DF

B. CB = FE

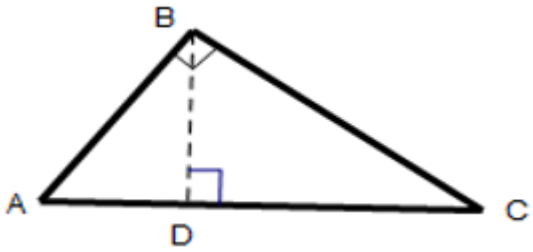
C. ∠ACB ≅ ∠DFE

D. ∠BAC ≅ ∠EDF

Similarity, Right Triangles, and Trigonometry
G-SRT.B.4
Items 94 – 103

ITEM 94

In ΔABC, ∠ABC is a right angle and AC = 25. In ΔABD, ∠ADB is a right angle and AD = 9.



Find AB.

A. 16

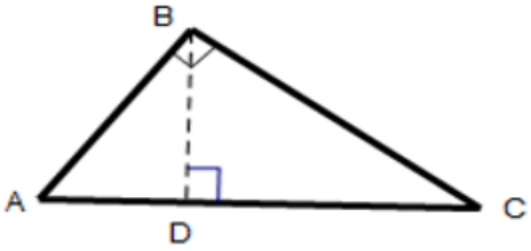
B. 12

C. 20

D. 15

ITEM 95

In ΔABC, ∠ABC is a right angle and AC = 25. In ΔABD, ∠ADB is a right angle and AD = 9.



Find BD.

A. 25

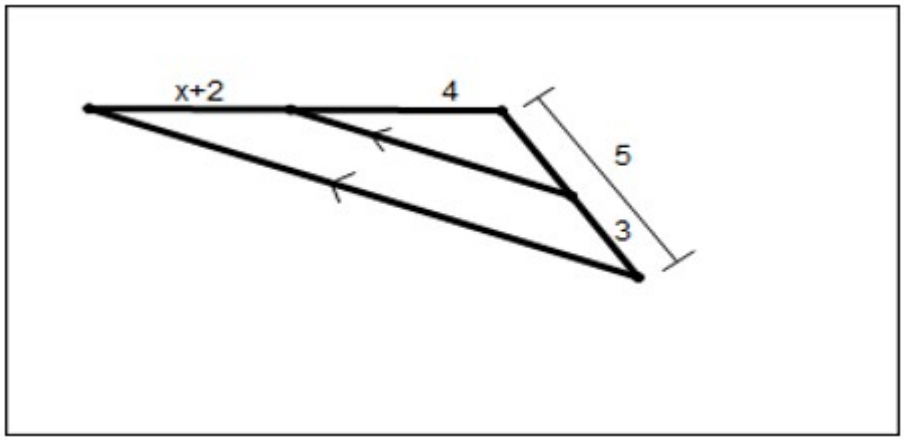
B. 9

C. 12

D. 15

ITEM 96

Use the information shown in the triangle below to find the value of x.



A. 11

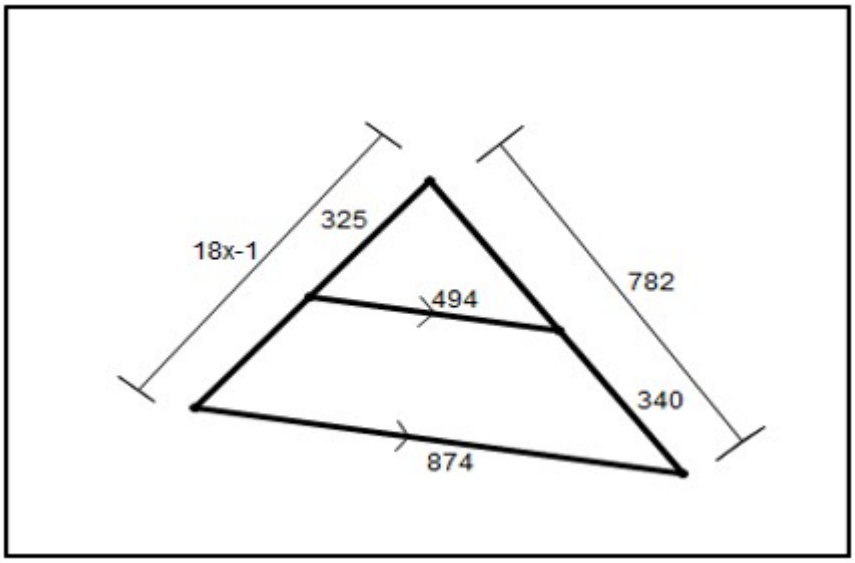
B. 4

C. 13

D. 7

ITEM 97

Use the information shown in the triangle below to find the value of x.



A. 32

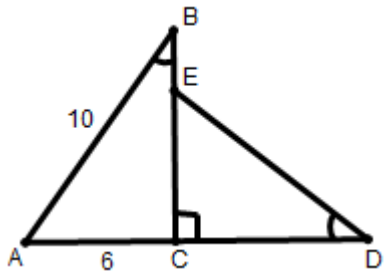
B. 33

C. 31

D. 50

ITEM 98

In the figure below BC = CD. Find BE.



A. 0

B. 2

C. 4

D. 6

ITEM 99

A lighthouse casts a 128-foot shadow. A nearby lamppost that measures 5 feet 3 inches casts an 8-foot shadow. Let x represent the height of the lighthouse, which of the following proportions can be used to determine the height of the lighthouse?

A. $\frac{x}{128} = \frac{21}{32}$

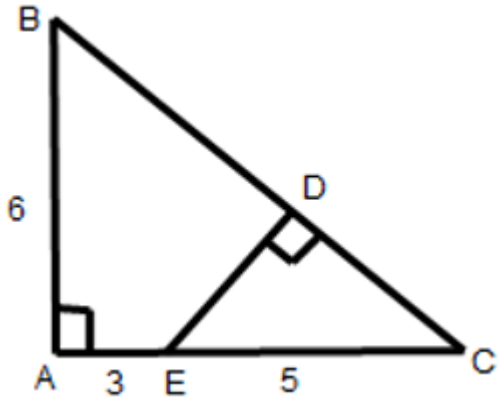
B. $\frac{x}{128} = \frac{40}{5.3}$

C. $\frac{x}{8} = \frac{5.3}{128}$

D. $\frac{x}{8} = \frac{21}{640}$

ITEM 100

If $\overline{BA} \perp \overline{CA}$ and $\overline{ED} \perp \overline{BC}$



What is DC x BC?

A. 30

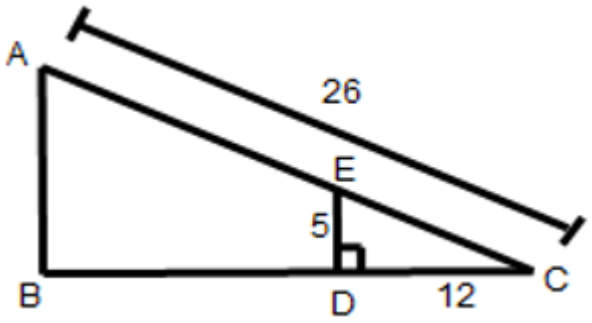
B. 40

C. 50

D. 60

ITEM 101

In ΔABC, $\overline{DE}$ is parallel to $\overline{AB}$. $\overline{DE}$ is perpendicular to $\overline{BC}$. The length of $\overline{AC}$ is 26 inches. The length of $\overline{DC}$ is 12 inches. The length of $\overline{DE}$ is 5 inches.$\overline{AB}$



What is the length of $\overline{AB}$ to the nearest tenth of an inch?

A. 2.5

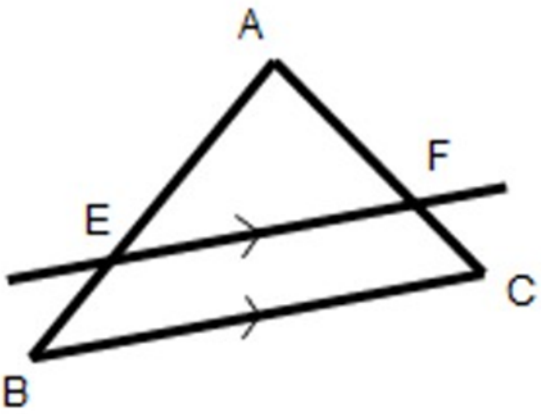
B. 10.0

C. 10.9

D. 11.9

ITEM 102

Suppose ΔABC and $\overline{EF}$ intersect at sides $\overline{AB}$ and $\overline{AC}$. $\overline{EF}$ is parallel to $\overline{BC}$.



Which **two** statements would be needed to prove that ΔABC is similar to ΔAEF

A. $m\angle AEF = m\angle ABC$

B. $\overline{AE} \cong \overline{EB}$

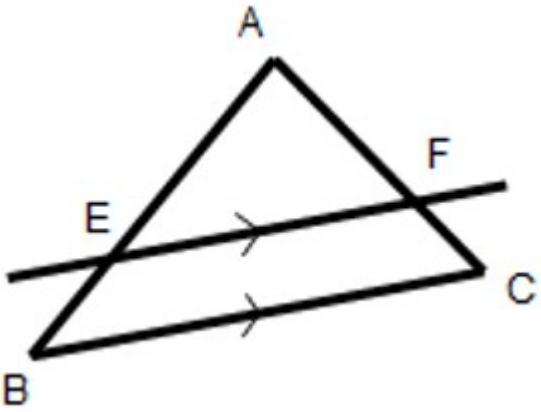
C. $\angle A \cong \angle A$

D. $BC = 2\,EF$

E. $m\angle AEF + m\angle ABC = 180$

ITEM 103

Given ΔABC and $\overline{EF}$ such that $\overline{EF}$ is parallel to $\overline{BC}$.



Which of the following must be true?

A. F is the midpoint of $\overline{AC}$

B. $\frac{AE}{FC} = \frac{AF}{EB}$

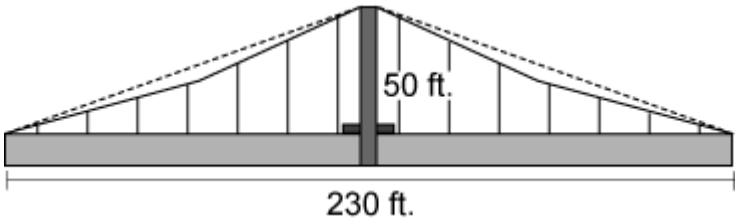
C. $EF = \frac{1}{2}BC$

D. $\frac{BE}{AB} = \frac{CF}{AC}$

Similarity, Right Triangles, and Trigonometry
G-SRT.B.5
Items 104 – 125

ITEM 104

Armando designs a suspension bridge. He makes this drawing to show its size.



After the bridge is built, Armando is asked to design another bridge. The second bridge needs to have a similar shape to Armando's first bridge, but it only needs to be 184-feet long. How tall does the second bridge need to be?

A. 32 feet

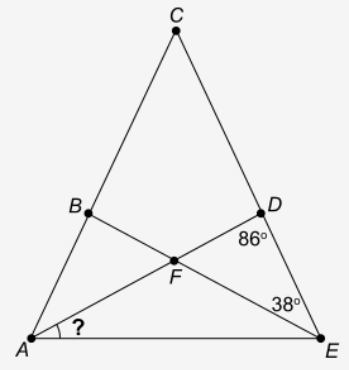
B. 36 feet

C. 40 feet

D. 44 feet

ITEM 105

Use the diagram to answer the question.



Triangle *ABF* is congruent to triangle *EDF*.

What is the measure of angle *FAE*?

A. 28°

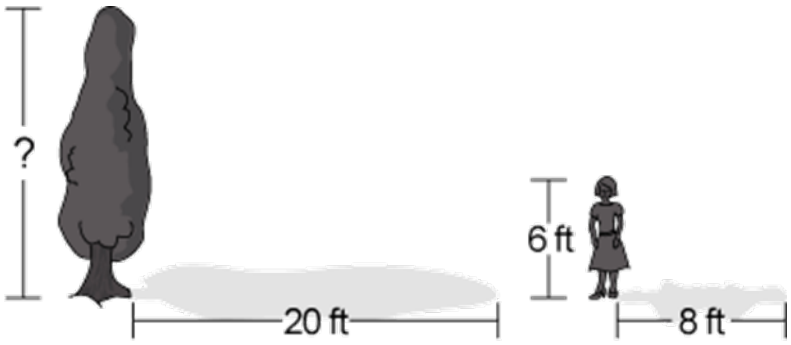
B. 38°

C. 56°

D. 86°

ITEM 106

Ms. Castille is about 6 feet tall. At 3:00 P.M. her shadow is 8 feet long and the tree's shadow 20 is feet long.



About how tall is the tree?

A. 15 feet

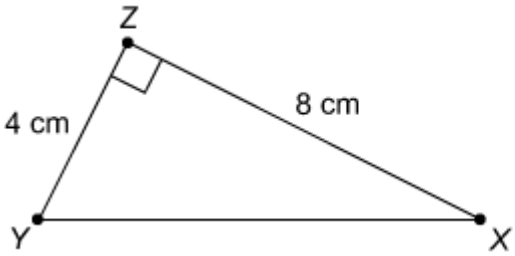
B. 18 feet

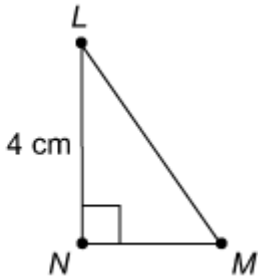
C. 22 feet

D. 24 feet

ITEM 107

Triangle *XYZ* is similar to triangle *LMN.*





How long is side *MN*?

A. 2 centimeters

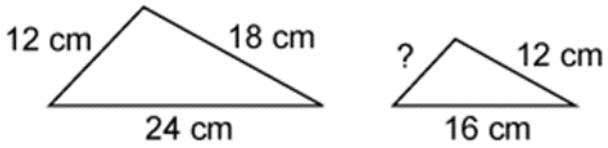
B. 4 centimeters

C. 8 centimeters

D. 16 centimeters

ITEM 108

Howard draws two similar triangles.



How long is the third side of the smaller triangle?

A. 8 centimeters

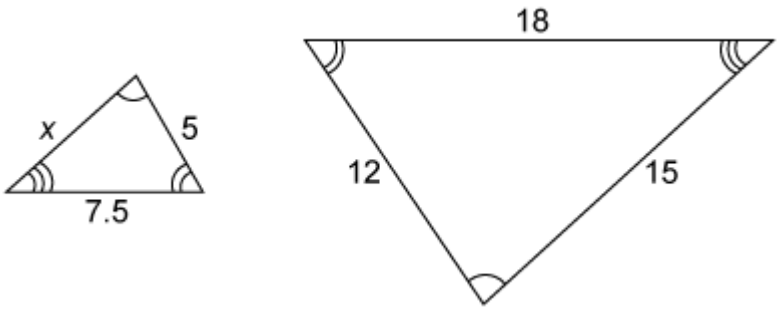
B. 9 centimeters

C. 22 centimeters

D. 24 centimeters

ITEM 109

These triangles are similar.



What is the value of *x*?

A. 6.00

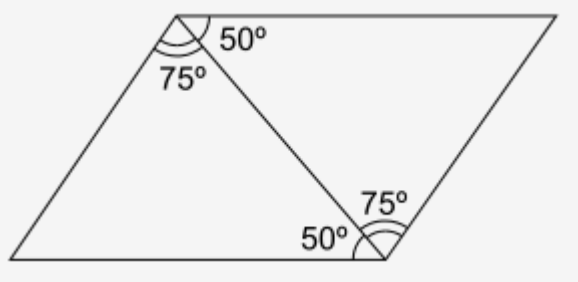
B. 6.25

C. 9.00

D. 10.50

ITEM 110

How are these two triangles related?



A. congruent by side-side-side

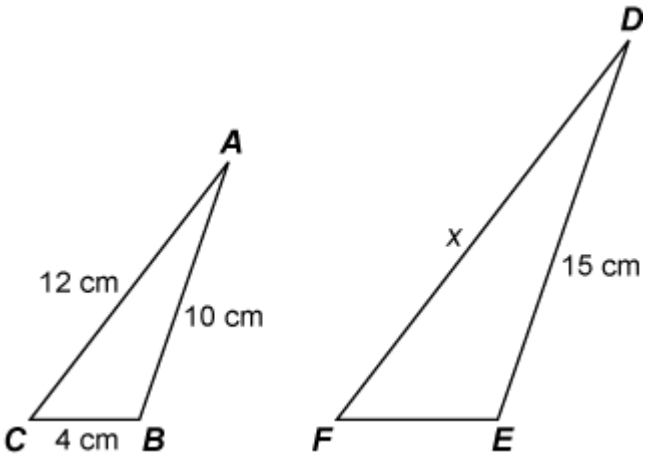
B. congruent by side-angle-side

C. congruent by angle-side-angle

D. similar but not congruent

ITEM 111

Triangle *ABC* is similar to triangle *DEF*.



What is the length of side *FD*?

A. 6 cm

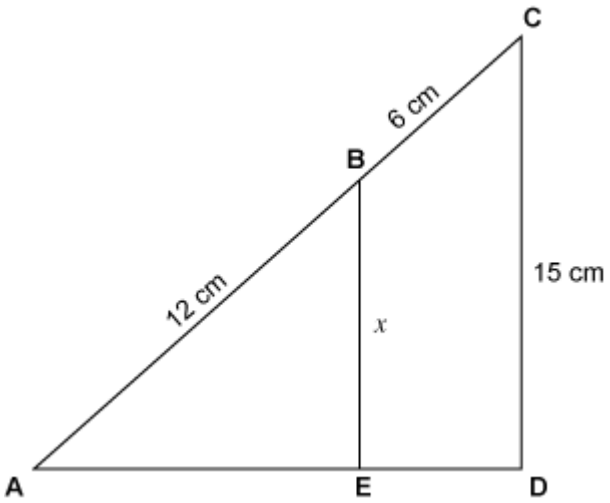
B. 12 cm

C. 17 cm

D. 18 cm

ITEM 112

Use the diagram of two triangles shown below to answer this question.



Triangles ACD and ABE are similar. What is *x* equal to?

A. 30.0 cm

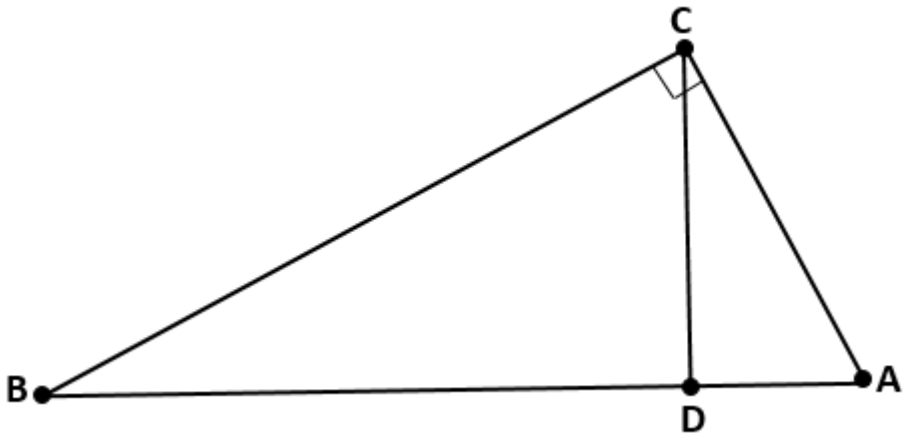
B. 4.8 cm

C. 14.4 cm

D. 10.0 cm

ITEM 113

In right ΔABC, altitude $\overline{CD}$ intersect hypotenuse $\overline{AB}$ at D. Which equation is always true?



A. $\frac{AD}{AC} = \frac{CD}{BC}$

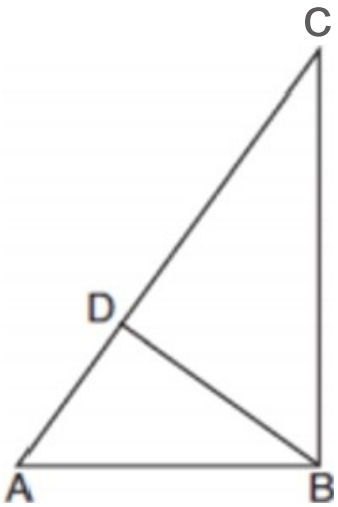
B. $\frac{AD}{AC} = \frac{BD}{BC}$

C. $\frac{AC}{CD} = \frac{BC}{CD}$

D. $\frac{AD}{AC} = \frac{AC}{BD}$

ITEM 114

Altitude $\overline{BD}$ is drawn to hypotenuse $\overline{AC}$ of right ΔABC. Which proportion must be true?



A. $\frac{AD}{AB} = \frac{BC}{AC}$

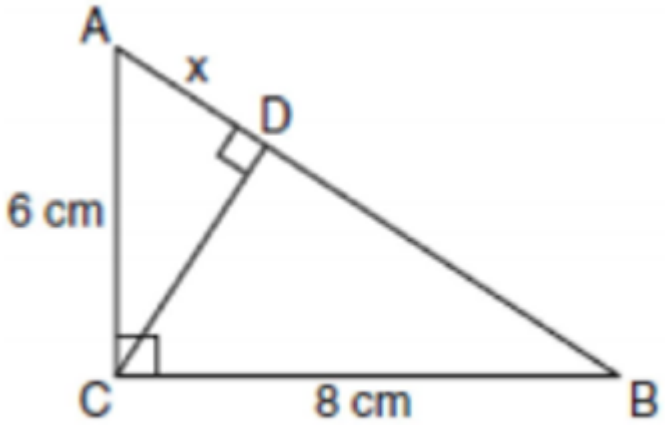
B. $\frac{AD}{AB} = \frac{AB}{AC}$

C. $\frac{BD}{BC} = \frac{AB}{AD}$

D. $\frac{AB}{BC} = \frac{BD}{AC}$

ITEM 115

In right ΔABC, the length of $\overline{AC}$ is 6 cm and the length of $\overline{BC}$ is 8 cm. If $\overline{CD}$ is drawn to the hypotenuse of ΔABC, find the height of $\overline{AD}$ to the nearest tenth of a centimeter.



A. 3.6

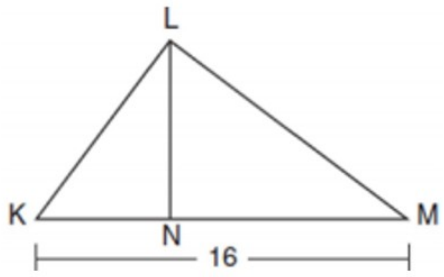
B. 6.0

C. 6.4

D. 4.0

ITEM 116

Jacob is testing values that would make ΔKLM a right triangle when LN is an altitude and KM = 16, as shown in the figure. Which would make ΔKLM a right triangle?



A. $LM = 13$ and $KN = 6$

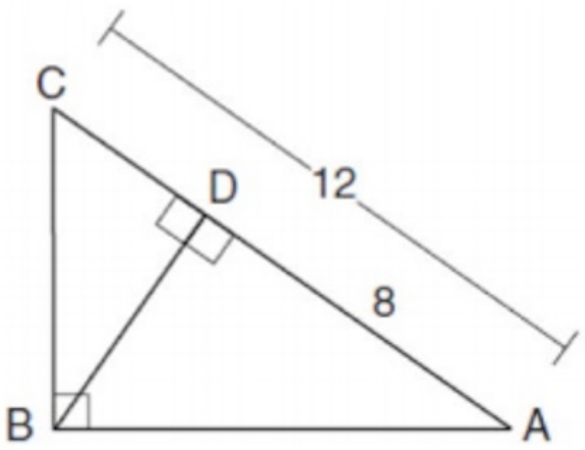
B. LM = 12 and NM = 9

C. $KL = 11$ and $KN = 7$

D. $LN = 8$ and $NM = 10$

ITEM 117

In the figure, ΔABC is a right triangle, whereby ∠ABC is a right angle, AC = 12, AD = 8, and BD is an altitude. Find the length of BC.



A. $4\sqrt{2}$

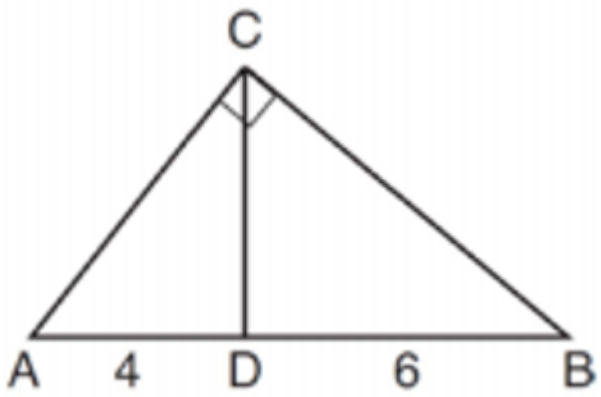
B. $4\sqrt{3}$

C. $4\sqrt{5}$

D. $4\sqrt{6}$

ITEM 118

In right triangle ABC, CD intersects hypotenuse AB at D. If AD = 4 and DB = 6, which length of AC makes CD ⊥ AB?



A. $2\sqrt{6}$

B. $2\sqrt{10}$

C. $2\sqrt{15}$

D. $4\sqrt{2}$

ITEM 119

Given ΔABC ~ ΔDEF and ratio of AB to DE is 3:1. Which of the following ratio is also 3:1?

A. $\frac{m\angle A}{m\angle D}$

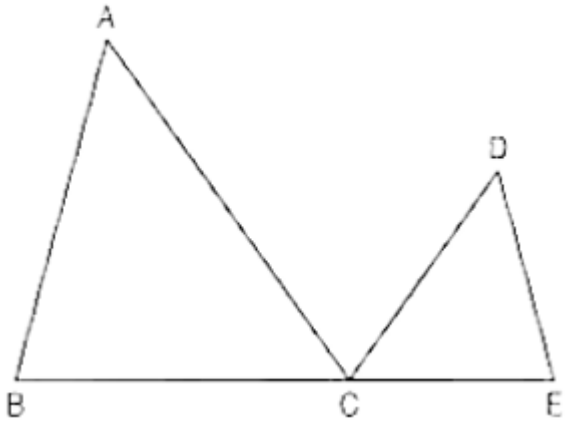
B. $\frac{AB}{EF}$

C. $\frac{perimeter\ of\ \Delta ABC}{perimeter\ of\ \Delta DEF}$

D. $\frac{area\ of\ \Delta ABC}{area\ of\ \Delta DEF}$

ITEM 120

In the diagram below, ΔABC ~ ΔDEC. The perimeter of ΔABC = 30. What is the perimeter of ΔDEC if AC = 12, DC = 7, and DE = 5?



A. 12.5

B. 14.0

C. 14.8

D. 17.5

ITEM 121

The area of two similar isosceles triangles are in the ratio 16:25. The ratio of their corresponding altitudes is which of the following?

A. 3:2

B. 4:5

C. 5:4

D. 5:7

ITEM 122

A triangle shaped piece of land has a perimeter of 120 meters. A scale drawing of this piece of a land has sides of lengths 8 centimeters, 15 centimeters, and 17 centimeters. The length of the longest side of this piece of land is which of the following?

A. 24 meters

B. 40 meters

C. 45 meters

D. 51 meters

ITEM 123

A sailboat has two sails that are similar triangles. The larger sail has sides of 10 feet, 24 feet, and 26 feet while the shortest side of the smaller sail is 6 feet. The perimeter of the smaller sail is which of the following?

A. 15 feet

B. 36 feet

C. 60 feet

D. 100 feet

ITEM 124

Two triangles are similar and the ratio of each pair of corresponding sides is 2:1. Which statement regarding the two triangles is **not** true?

A. Their areas have a ratio of 4:1.

B. Their altitudes have a ratio of 2:1.

C. Their perimeters have a ratio of 2:1.

D. Their corresponding angles have a ratio of 2:1.

ITEM 125

When Jaylyn measures the shadow of a yard stick, it is 6 inches. At the same time the shadow of the tree he wants to chop down is 15 feet. How tall is the tree in yards?

A. 5

B. 15

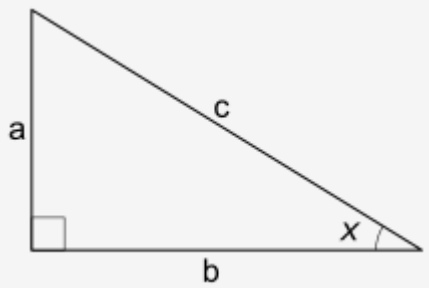
C. 30

D. 90

Similarity, Right Triangles, and Trigonometry
G-SRT.C.6
Items 126 – 132

ITEM 126

Use the diagram to answer the question.



The value of the tangent of angle *x* is defined as $\frac{a}{b}$.

Which fact makes it possible to define the tangent of an angle?

A. The sum of the interior angles of a triangle equals 180°.

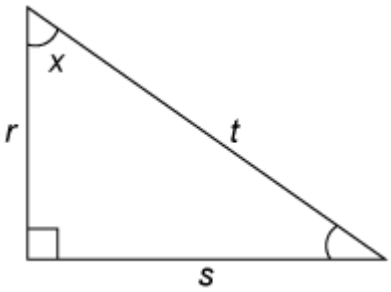
B. The angle and side measurements of congruent right triangles are equal.

C. All right triangles that share one congruent acute angle are similar, and therefore have equal side ratios.

D. For all right triangles that share one congruent acute angle, the other acute angle is also congruent.

ITEM 127

This right triangle has side lengths *r*, *s*, and *t* .



What is the tangent of angle *x*?

A. $\frac{r}{s}$

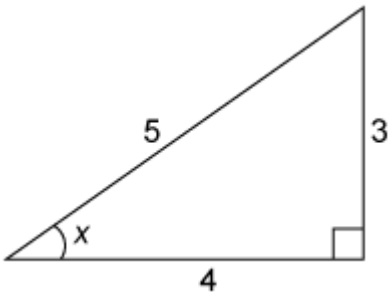
B. $\frac{s}{r}$

C. $\frac{r}{t}$

D. $\frac{s}{t}$

ITEM 128

Which fraction is equal to the cosine of *x*?



A. $\frac{3}{5}$

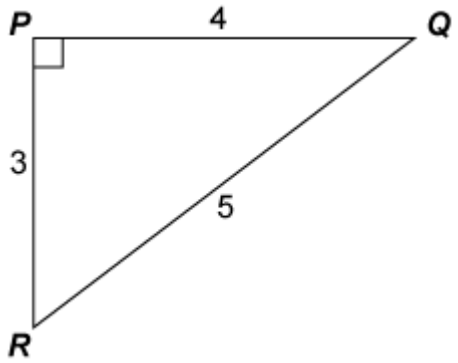
B. $\frac{4}{5}$

C. $\frac{5}{4}$

D. $\frac{5}{3}$

ITEM 129

Triangle *PQR* is a right triangle.



What is tan *Q*, to the nearest hundredth?

A. 0.60

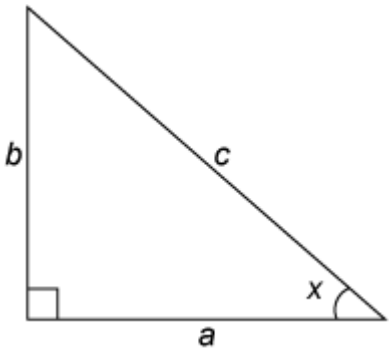
B. 0.75

C. 0.80

D. 1.33

ITEM 130

What is the sine of angle *x*?



A. $\frac{a}{c}$

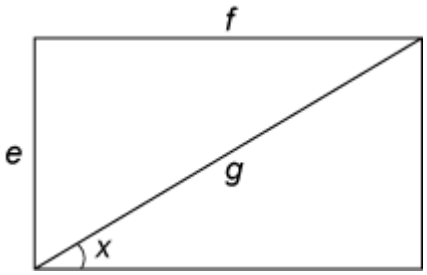
B. $\frac{b}{a}$

C. $\frac{b}{c}$

D. $\frac{c}{b}$

ITEM 131

What is the tangent of angle *x* in this rectangle?



A. $\frac{e}{f}$

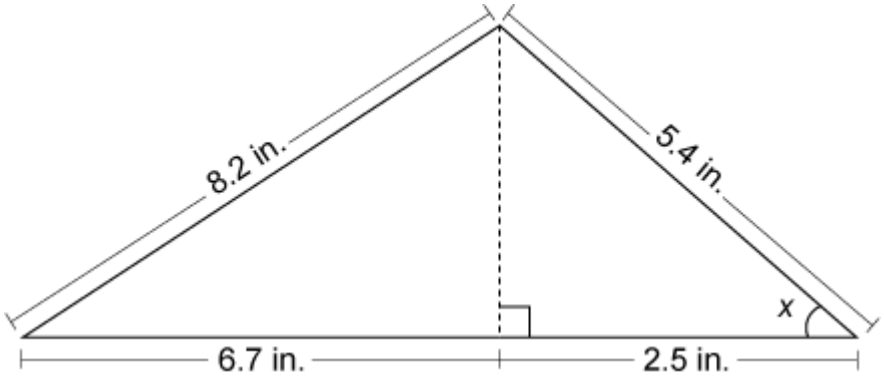
B. $\frac{b}{c}$

C. $\frac{b}{a}$

D. $\frac{f}{g}$

ITEM 132

Which fraction represents the value of cos *x*?



A. $\frac{2.5}{5.4}$

B. $\frac{5.4}{9.2}$

C. $\frac{5.4}{8.2}$

D. $\frac{9.2}{5.4}$

Similarity, Right Triangles, and Trigonometry
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Items 133 – 142

ITEM 133

Adnan states if cos 30° = 0.866, then sin 30° = 0.866.

Which justification correctly explains whether or not Adnan is correct?

A. Adnan is correct because cos x° and sin x° are always equivalent in any right triangle.

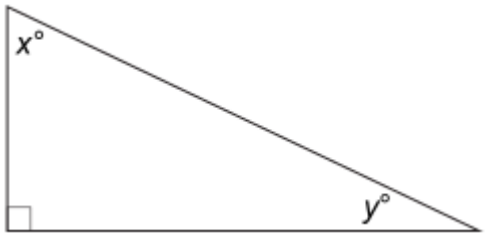
B. Adnan is correct because cos x° and sin x° are only equivalent in a 30°-60°-90° triangle.

C. Adnan is incorrect because cos x° and sin (90 - x)° are always equivalent in any right triangle.

D. Adnan is incorrect because only cos x° and cos (90 - x)° are equivalent in a 30°-60°-90° triangle.

ITEM 134

Use the triangle to answer the question.



Which equation shows a correct relationship of trigonometric functions?

A. $\frac{\sin x}{\cos x} = 0$

B. $\frac{\sin x}{\cos y} = 0$

C. $\frac{\sin x}{\cos x} = 1$

D. $\frac{\sin x}{\cos y} = 1$

ITEM 135

In ΔEFG, ∠F is a right angle. If $\sin E = \frac{5}{\sqrt{26}}$, which statement must be true?

A. m∠E = 90° + m∠G

B. m∠E = m∠G

C. m∠E < m∠G

D. m∠E > m∠G

ITEM 136

Given ΔPQR with right angle R and $sinP = \frac{1}{4}$. Which of the following two expressions are also equal to $\frac{1}{4}$?

A. cos P

B. cos Q

C. cos (90 – P)

D. cos (90 – Q)

E. sin Q

ITEM 137

In ΔMNO, m∠O = 90°. m∠M does not equal m∠N. If sin M = x and cos M = y, what is cos N + sin N?

A. $x + y$

B. $x - y$

C. $y - x$

D. $90 - (x + y)$

ITEM 138

Angle F is an acute angle such that sin F = cos (F + 30). What is m∠F?

A. 20°

B. 30°

C. 60°

D. 70°

ITEM 139

Angles $(t + 10)^\circ$ and $(3t + 20)^\circ$ are two angles in a right triangle such that $\sin(t + 10)^\circ = \cos(3t + 20)^\circ$. The degree measures of these two angles are which of the following?

A. 30° and 60°

B. 45° and 45°

C. 25° and 65°

D. 40° and 50°

ITEM 140

In ΔXYZ, m∠Z = 90° and cos X = $\frac{1}{5}$. What is sin Y?

A. $\frac{1}{5}$

B. $\frac{3}{5}$

C. 90 - $\frac{1}{5}$

D. 90 - $\frac{4}{5}$

ITEM 141

In ΔEFG, ∠F is a right angle. If sin E = m, find cos G.

A. 90 – m

B. 45 – m

C. 90 + m

D. m

ITEM 142

Given that cos 21° = 0.93, which of the following ratios is approximately 0.93?

A. cos 69°

B. csc 69°

C. sec 69°

D. sin 69°

Similarity, Right Triangles, and Trigonometry
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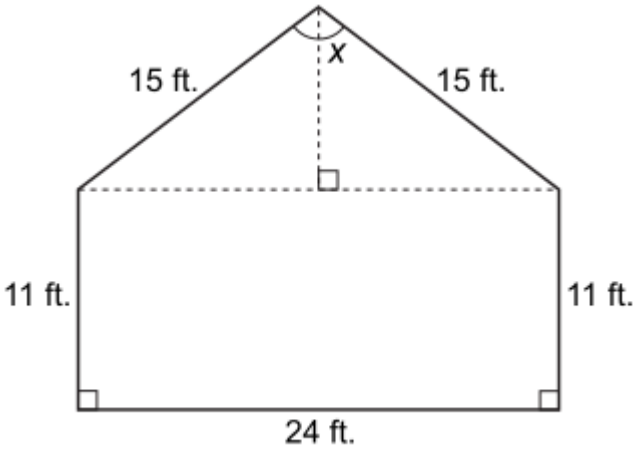
Items 143 – 166

ITEM 143

The house shown below has a symmetrical roof.



Note: Not to scale

What is the measure of the angle the roof makes at the peak (angle *x*)?

A. 53.1°

B. 73.7°

C. 102.6°

D. 106.3°

ITEM 144

Right triangle *FGH* has leg *FG* with a length of 12 centimeters and leg *GH* with a length of 16 centimeters. To the nearest whole degree, what is the measure of angle *GHF*?

A. 37°

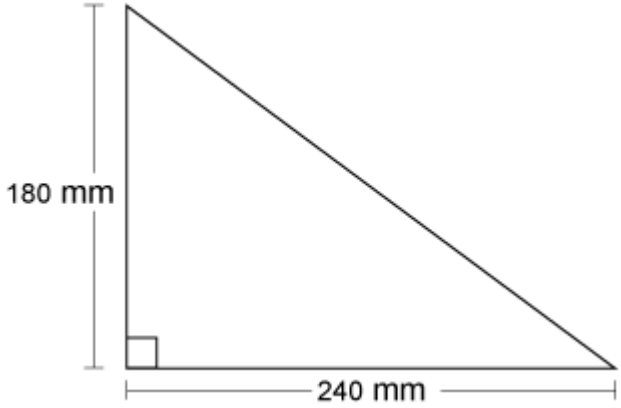
B. 45°

C. 53°

D. 90°

ITEM 145

What is the perimeter of this right triangle?



A. 300 millimeters

B. 420 millimeters

C. 720 millimeters

D. 840 millimeters

ITEM 146

This list shows the lengths of the sides of a right triangle.

- leg = 10 meters
- leg = 3 *x* meters
- hypotenuse = 26 meters

What is the value of *x*?

A. 4

B. 8

C. 12

D. 14

ITEM 147

A 60-foot flagpole was placed in front of a post office, perpendicular to the ground. After many years, the flagpole began to lean. The distance from the top of the flagpole to the ground is now 50 feet. Which expression shows how to determine the angle the flagpole makes with the ground?

A. $\sin A = \frac{50}{60}$

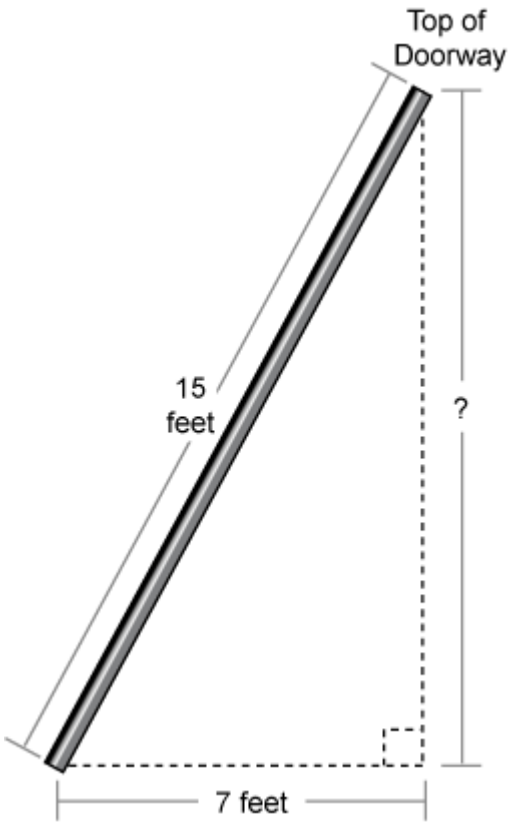
B. $\cos A = \frac{50}{60}$

C. $\sin A = \frac{60}{50}$

D. $\cos A = \frac{60}{50}$

ITEM 148

Mr. Anderson bought a flagpole at a hardware store. He tilts the flagpole so it will fit through the doorway of the store.



What is the distance between the floor and the top of the doorway, rounded to the nearest tenth of a foot?

A. 8 feet

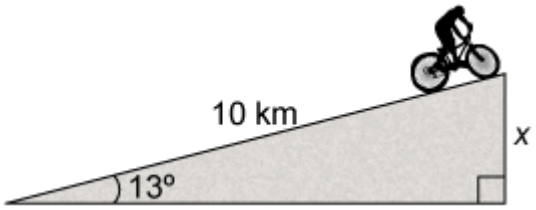
B. 13.2 feet

C. 16.6 feet

D. 22 feet

ITEM 149

A cyclist pedals up a hill that has a 13° angle. If the cyclist pedals up the hill for 10 kilometers, what is the change in her elevation, *x*?



A. 0.22 kilometer

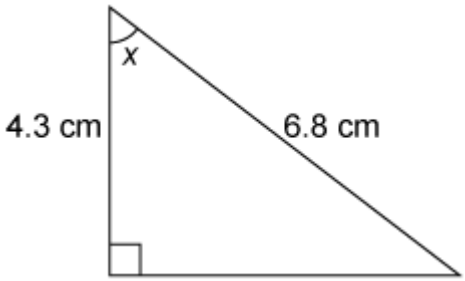
B. 2.2 kilometers

C. 9.7 kilometers

D. 45.0 kilometers

ITEM 150

What is the measure of angle *x* ?



A. 32.3°

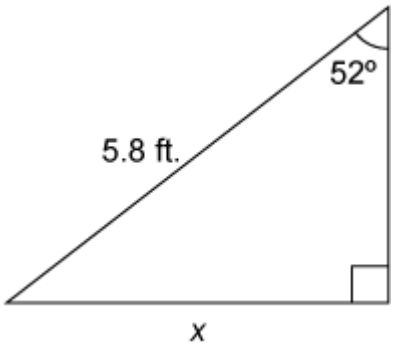
B. 39.2°

C. 50.8°

D. 63.2°

ITEM 151

Which measurement is closest to the value of *x*?



A. 0.11 foot

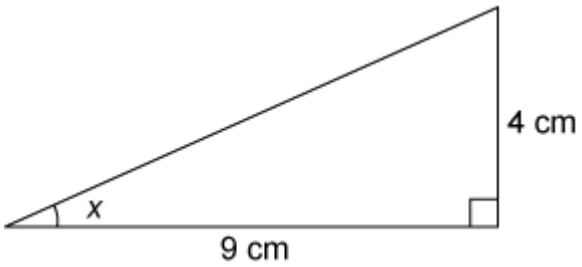
B. 0.14 foot

C. 3.6 feet

D. 4.6 feet

ITEM 152

What is the measure of angle *x*, rounded to the nearest hundredth?



A. 23.96°

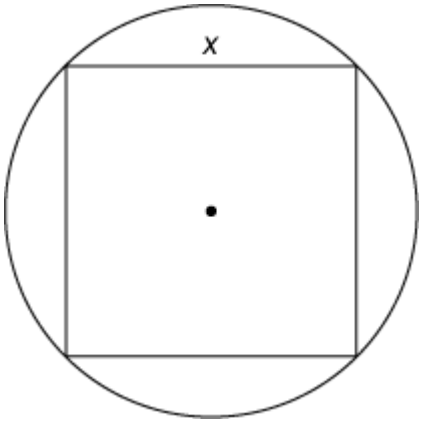
B. 26.39°

C. 63.61°

D. 66.04°

ITEM 153

The side length of this square is *x*. What is the radius of the circle?



A. x^2

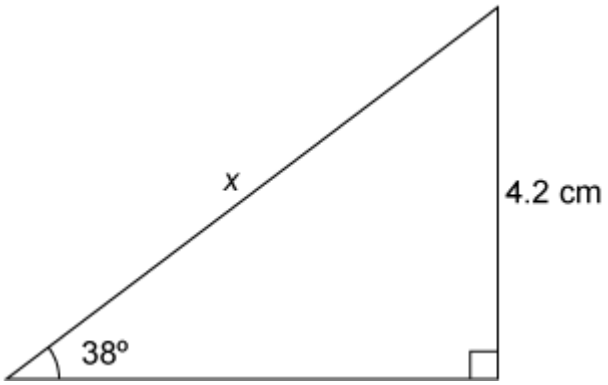
B. $x\sqrt{2}$

C. $\frac{3x}{2}$

D. $\frac{x\sqrt{2}}{2}$

ITEM 154

What is the value of *x*, rounded to the nearest tenth?



A. 2.6 centimeters

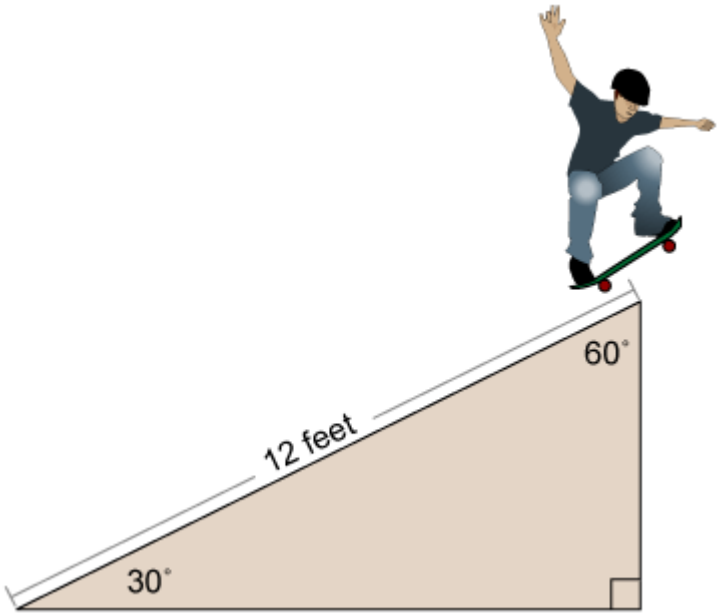
B. 3.3 centimeters

C. 5.3 centimeters

D. 6.8 centimeters

ITEM 155

Javier built this skateboard ramp.



What is the height of the ramp, to the nearest foot?

A. 6 feet

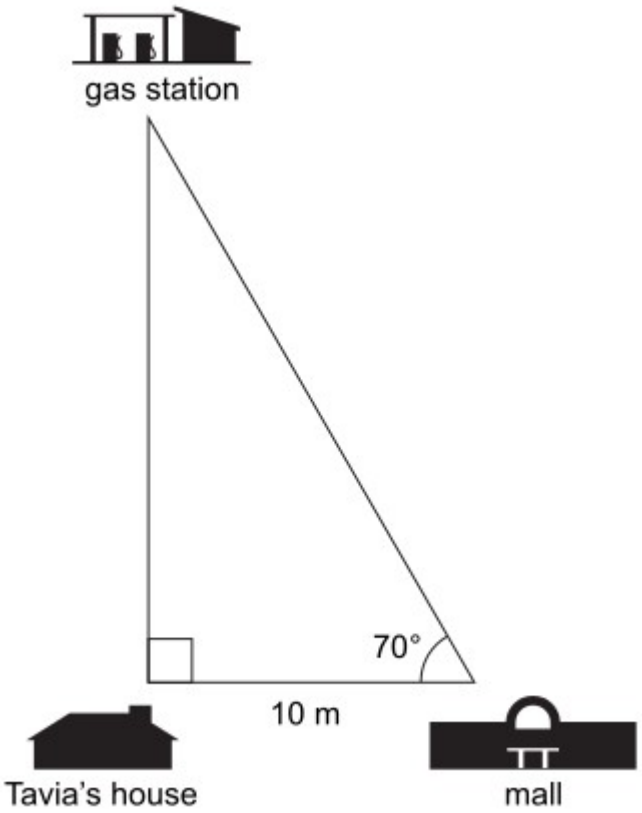
B. 8 feet

C. 10 feet

D. 12 feet

ITEM 156

Use the diagram to answer the question.



What is the distance between Tavia's house and the gas station in this diagram?

A. 3.4 meters

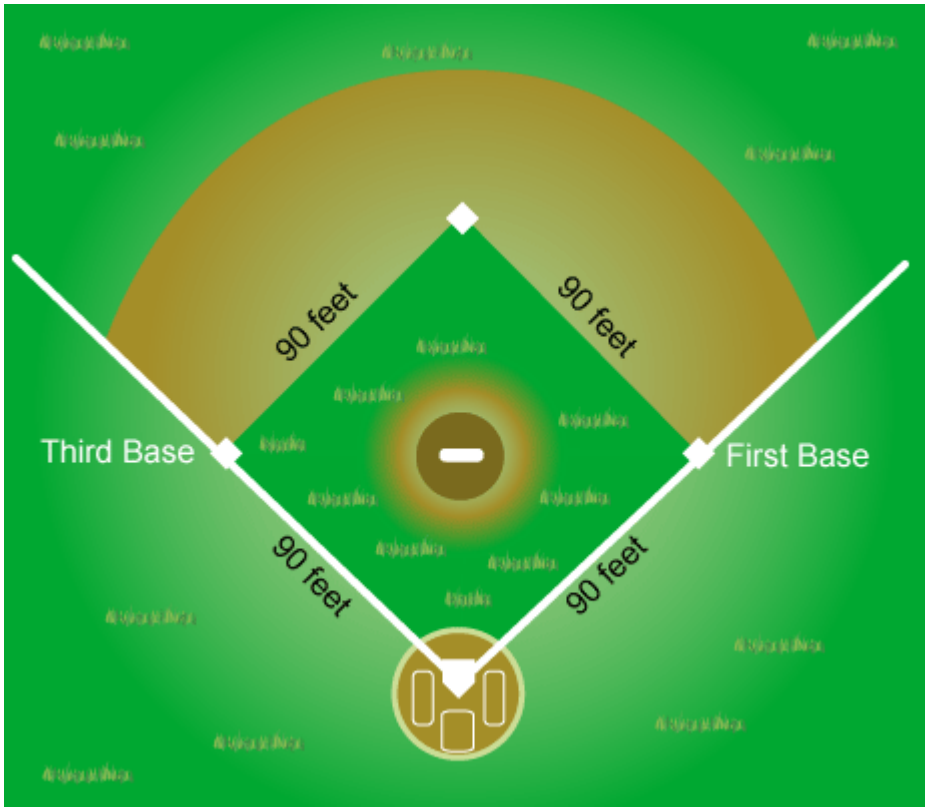
B. 3.6 meters

C. 27.5 meters

D. 29.2 meters

ITEM 157

Maddie throws a baseball from third base to first base. The four 90-foot lines between the bases form a square. Which number is the **best** estimate of how far Maddie throws the baseball?



A. 90 feet

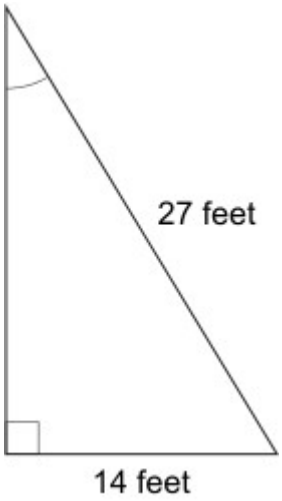
B. 130 feet

C. 150 feet

D. 180 feet

ITEM 158

A 27-foot ladder leans against a building. It is 14 feet from the base of the building. What is the measure of the angle formed by the ladder and the building rounded to the nearest tenth?



A. 27.4°

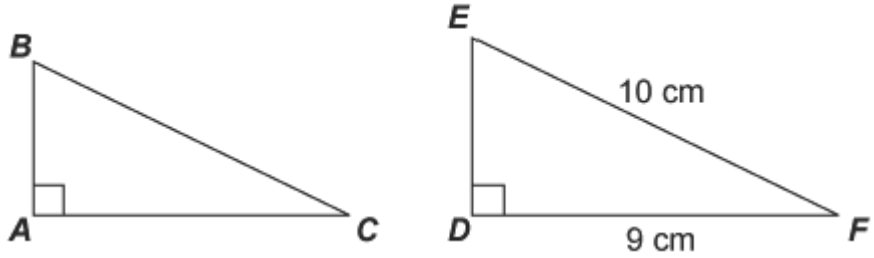
B. 31.2°

C. 58.8°

D. 62.6°

ITEM 159

Triangles *ABC* and *DEF* are similar.



What is the measure of angle *C*, rounded to the nearest tenth?

A. 25.8°

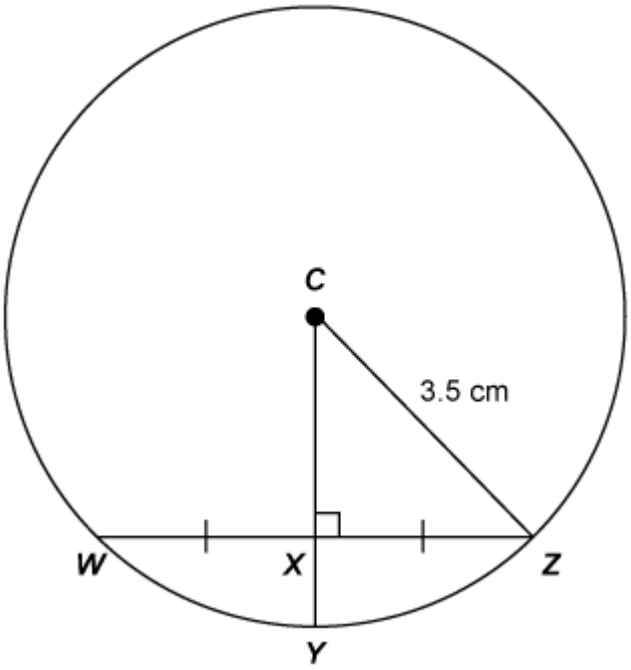
B. 42.0°

C. 64.1°

D. 90.0°

ITEM 160

Segments *CY* and *CZ* are radii of circle *C*.



Chord *WZ* is 5.6 centimeters long. What is the length of *XY*?

A. 0.6 centimeters

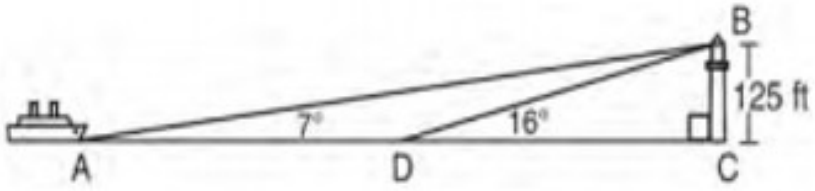
B. 1.4 centimeters

C. 2.1 centimeters

D. 2.8 centimeters

ITEM 161

As shown in the diagram below, a ship is heading directly toward a lighthouse whose beacon is 125 feet above sea level. At the first sighting, point A, the angle of elevation from the ship to the light was 7°. A short time later, at point D, the angle of elevation was 16°. To the nearest foot, determine and state how far the ship traveled from point A to point D.



Enter your work below.

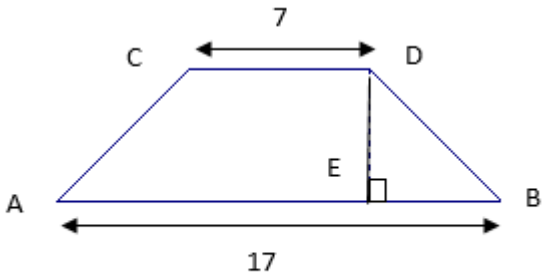
_____

_____

_____

ITEM 162

The lengths of the bases in isosceles trapezoid ABDC are 7 inches and 17 inches and the measure of each of the base angles is 45° as shown below.



$m\angle A = m\angle B = 45°$

- Find the distance between the two bases. Explain how you know.
- Find length of $\overline{BD}$.
- Find the perimeter of the trapezoid.

Express your answer in **exact** form using the appropriate units. Show your work.

Enter your answers, explanation, and perimeter below.

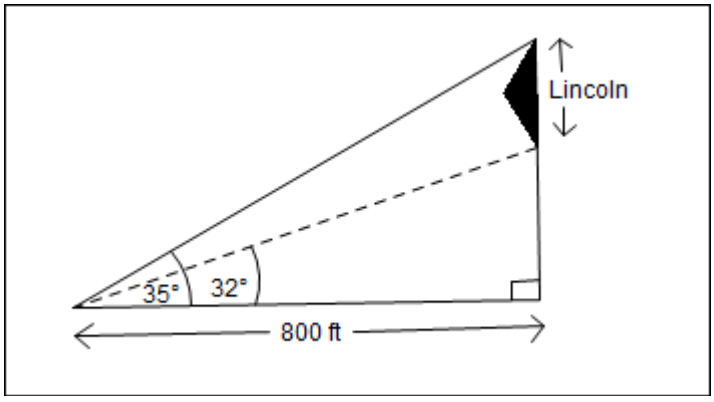
_____

_____

_____

ITEM 163

To measure the height of Lincoln's face on Mt. Rushmore, two sightings 800 feet from the base of the mountain are taken. If the angle of elevation to the bottom of the Lincoln's face is 32° and the angle of elevation to the top of the Lincoln's face is 35°. What is height of Lincoln's face to the nearest tenth of a foot?



Enter all your work and your answer below.

_____

_____

_____

ITEM 164

A 25-foot ladder is placed against a building. The bottom of the ladder is 7 feet from the building. If the top of the ladder slips down 4 feet, how many feet will the bottom slide out?

A. 4 feet

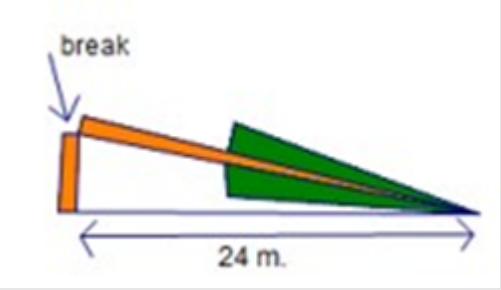
B. 8 feet

C. 11 feet

D. 15 feet

ITEM 165

An ancient bald cypress tree 36 meters tall was toppled above its base by the wind during a hurricane and fell as if hinged (see figure). The tip of the once majestic tree hit the ground 24 feet from its base. A researcher wishes to investigate the break crack. How many meters (to the nearest hundredth) up from the base of the tree does the researcher have to climb?



A. 10.00 meters

B. 12.00 meters

C. 36 meters

D. 26.83 meters

ITEM 166

A surveyor is 100 meters from the base of a building. The angle of elevation to the top of the building is 26°. The surveyor's instrument is 1.73 meters above ground. Find the height of the building to the nearest hundredth of a meter.

A. 48.77 meters

B. 43.84 meters

C. 89.98 meters

D. 50.50 meters

Circles
G-C.A.1
Items 167 – 168

ITEM 167

Which statement explains why all circles are similar?

A. There are 360° in every circle.

B. The ratio of the circumference of a circle to its diameter is same for every circle.

C. The diameter of every circle is proportional to the radius.

D. The inscribed angle in every circle is proportional to the central angle.

ITEM 168

Two circles have the same center. Circle *P* has a radius of *p* units. Circle *Q* has a radius of *q* units with q > p.

Which dilation could be used to prove that circles *P* and *Q* are similar?

A. Dilate circle *P* by a scale factor of $\frac{p}{q}$.

B. Dilate circle *Q* by a scale factor of $\frac{p}{q}$.

C. Dilate circle *P* by a scale factor of $p \times q$.

D. Dilate circle *Q* by a scale factor of $p \times q$.

Circles
G-C.A.2
Items 169 – 176

ITEM 169

Triangle ABC is an isosceles right triangle inscribed in a circle. The center of the circle is point D and the diameter of the circle is $\overline{AC}$.

Which of the following would not be true for the triangle and circle described above?

A. $\overline{AD}$ is congruent to $\overline{DC}$ and to $\overline{BD}$

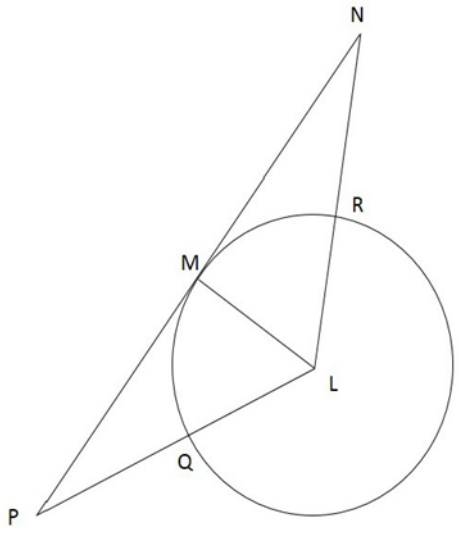
B. The measure of arc AB is equal to the measure of arc BC

C. The measure of $\angle B$ is 90 degrees

D. The measure of arc AC is equal to the measure of arc AB

ITEM 170

In the circle shown below, $\overline{LM}$ is a radius, and $\overline{PN}$ is tangent to circle L. ΔPLN is an isosceles triangle with ∠N and ∠P as base angles.



The length of $\overline{LM}$ is 5 cm, and the length of $\overline{PQ}$ is 8 cm. Which of the following is the approximate measure of arc QR?

A. 134.8°

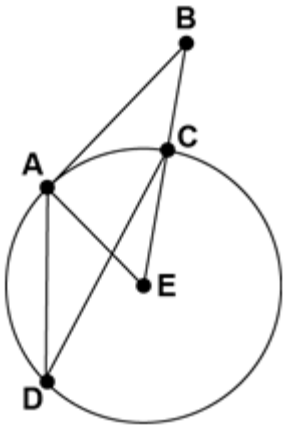
B. 67.4°

C. 157.8°

D. 137.9°

ITEM 171

In the circle shown below, E is the center of the circle, $\overline{AB}$ is tangent to the circle, the measure of $\angle ADC$ is 21 degrees and the length of $\overline{AE}$ is 6 inches.



Which of the following would be used to find the length of $\overline{BC}$?

A. $\frac{6}{sin\ 21} - 6$

B. $\frac{6}{sin\ 42} - 6$

C. $\frac{6}{cos\ 42} - 6$

D. $\frac{6}{cos\ 21} - 6$

ITEM 172

In a given circle, point M is the center of the circle, angle LMN is a central angle, and angle LPN is a circumscribed angle. If angle LMN is congruent to angle LPN, then which of the following would **not** be true?

A. Quadrilateral LMNP is a square.

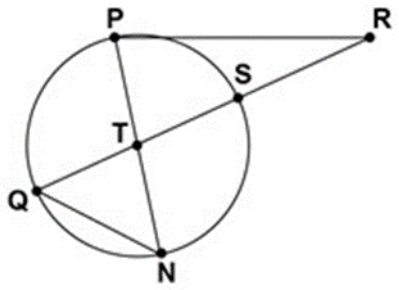
B. Triangle LMP is an isosceles right triangle.

C. The measure of arc LN is 180 degrees.

D. Segment LP is congruent to segment PN.

ITEM 173

In the circle shown below T is the center of the circle, and segments PN and SQ are diameters, and segment PR is tangent to the circle. The measure of angle SQN is 66 degrees.



Which of the following would be the measure of angle PRT?

A. 33 degrees

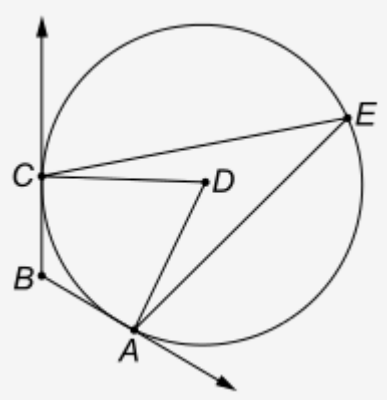
B. 42 degrees

C. 48 degrees

D. 66 degrees

ITEM 174

Use the diagram to answer the question.



Angle *AEC* is inscribed in circle *D*. Angle *ABC* circumscribes circle *D*.

Which equation about the relationships in the circle is **true**?

A. $\frac{1}{2}m\angle ADC = m\angle AEC$

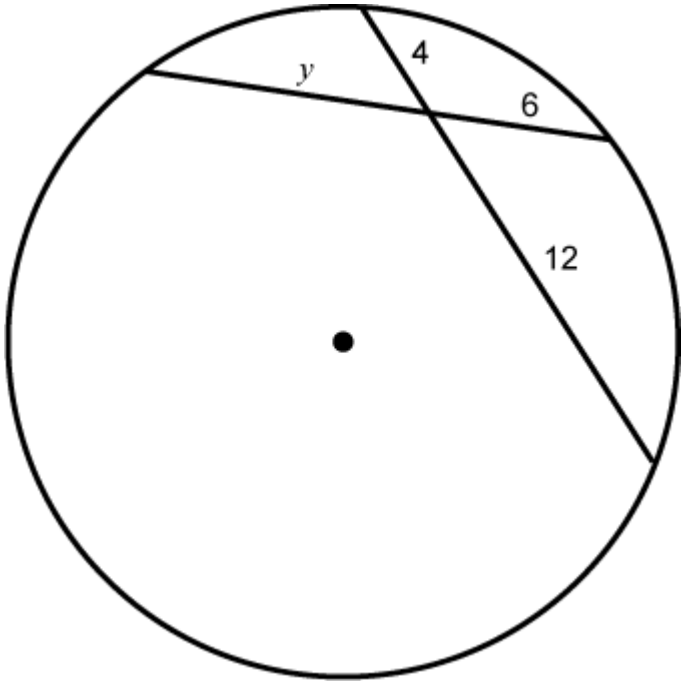
B. $\frac{1}{2}m\angle ABC = m\angle ADC$

C. $\frac{1}{2}m\angle ADC = m\angle ABC$

D. $\frac{1}{2}m\angle ABC = m\angle AEC$

ITEM 175

What is the length of *y* on this circle?



A. 8 units

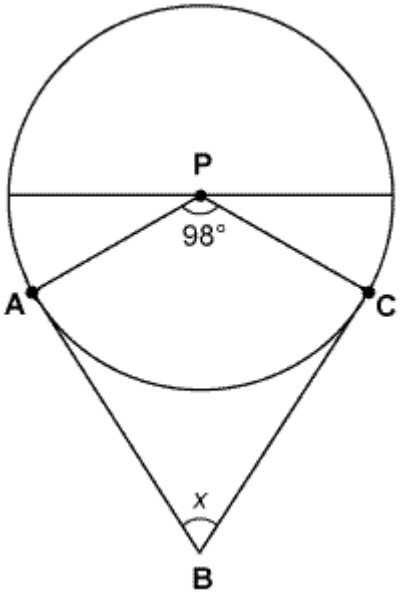
B. 10 units

C. 12 units

D. 18 units

ITEM 176

Segments AB and BC are tangent to circle P.



What is the value of *x*?

A. 82°

B. 88°

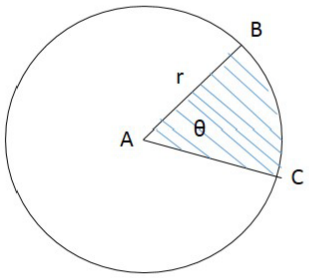
C. 92°

D. 98°

Circles
G-C.B.5
Items 177 – 180

ITEM 177

In the circle shown below, point A is the center of the circle, r is the length of $\overline{AB}$, and θ is the measure of <BAC.



The area of the shaded sector shown above is represented by the variable *a* in the formulas shown below. Which formula could be used to calculate the area of the shaded sector?

A. $\frac{\theta\ (measured\ in\ degrees)}{360} = \frac{a}{\pi r^2}$

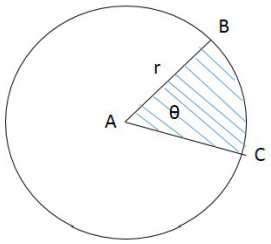
B. $\frac{\theta\ (measured\ in\ radians)}{360} = \frac{a}{\pi r^2}$

C. $\frac{\theta\ (measured\ in\ degrees)}{360} = \frac{a}{2\pi r}$

D. $\frac{\theta\ (measured\ in\ radians)}{360} = \frac{\pi r^2}{a}$

ITEM 178

In the circle shown below, ∠BAC is a central angle, r is the length of $\overline{AB}$, and θ is the measure of ∠BAC in degrees.



Which of the following would be used to derive the formula for the area of sector BAC?

A. The equation that sets the ratio of the area of sector BAC equal to the ratio of 360 to the area of the circle shown above.

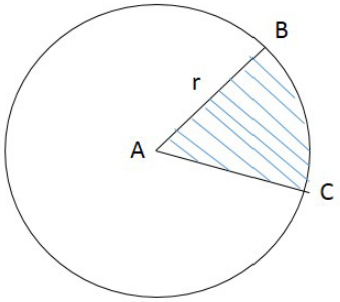
B. The equation that sets the ratio of the length of arc BC equal to the ratio of 360 to the circumference of the circle shown above.

C. The equation that sets the ratio of the measure of arc BC equal to the ratio of the area of sector BAC to the area of the circle shown above.

D. The equation that sets the ratio of the length of *r* to the area of the circle equal to the ratio of the area of sector BAC to the area of the circle shown above.

ITEM 179

In the circle shown below, ∠BAC is a central angle, and r is the length of $\overline{AB}$.



The area of the shaded sector is equal to $\frac{1}{2}r^2\theta$. Which of the following must be true about the value of θ?

A. θ = the measure of $\angle BAC$ in degrees.

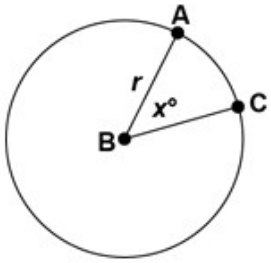
B. θ = the measure of $\angle BAC$ in radians.

C. θ = the difference between 360 and measure of $\angle BAC$ in degrees

D. θ = the difference between 2π and measure of $\angle BAC$ in radians

ITEM 180

In the circle shown below *r* is the length of the radius and *x* is the measure of central angle ABC.



Which of the following would be used to find the area of the sector defined by central angle ABC?

A. The area of the sector is $\frac{x}{360}$ times the area of the whole circle.

B. The area of the sector is $\frac{360-x}{360}$ times the area of the whole circle

C. The area of the sector is equal to $\frac{\pi r^2}{x}$.

D. The area of the sector is equal to $\frac{\pi r^2}{360-x}$.

Expressing Geometric Properties with Equations
G-GPE.A.1
Items 181 – 184

ITEM 181

The equation of a circle is $x^2 + y^2 - 4x + 2y = 11$.

What are the coordinates of the center of the circle?

A. (–4, 2)

B. (–2, 1)

C. (2, –1)

D. (4, –2)

ITEM 182

Find the equation of a circle that is going through A (3, 1) and B (-1, 3) and has the center at C (2, 4).

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

B. $(x + 2)^2 + (y + 4)^2 = 10$

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

D. $(x + 2)^2 + (y + 4)^2 = 10^2$

ITEM 183

Find the equation of the circle with center (1, 4) and radius equal to the square root of 8.

A. $(x + 1)^2 + (y + 4)^2 = 64$

B. $(x - 1)^2 + (y - 4)^2 = 64$

C. $(x + 1)^2 + (y + 4)^2 = 8$

D. $(x - 1)^2 + (y - 4)^2 = 8$

ITEM 184

Select the equation of a circle with center (-3, 7) and radius 5.

A. $(x - 3) + (y + 7) = 25$

B. $(x + 3) + (y - 7) = 25$

C. $(x - 3)^2 + (y + 7)^2 = 25$

D. $(x + 3)^2 + (y - 7)^2 = 25$

Expressing Geometric Properties with Equations
G-GPE.B.4
Items 185 – 195

ITEM 185

Rita wants to prove or disprove that the point (–1, 4) lies on the circle centered at (3, 1) and containing the point (3, –4). Her reasoning is shown in the informal proof below.

1. If the distance from (3, –4) to (3, 1) is the same as the distance from (3, –4) to (–1, 4) , then (–1, 4) lies on the circle.
2. The distance from (3, 1) to (3, –4) is 5.
3. The distance from (3, –4) to (–1, 4) can be found using the distance formula, as shown below.
4. $d = \sqrt{(3 - -1)^2 + (-4 - 4)^2}$
5. $d = \sqrt{4^2 + (-8)^2}$
6. $d = \sqrt{16 + 64}$
7. $d = \sqrt{80}$
8. $\sqrt{80} \neq 5$
9. Therefore, (–1, 4) does not lie on the circle.

What is the error in Rita's reasoning?

A. In step 1, she compares the distances between the wrong pairs of points.

B. In step 2, she in correctly calculates the distance between (3, 1) and (3, –4).

C. In step 4, she makes a sign error.

D. In step 5, she simplifies incorrectly.

ITEM 186

Which is the equation of a circle whose center is at the origin and that passes through the point (3, 5)?

A. $(x-3)^2+(y-5)^2=34$

B. $(x-3)^2+(x-5)^2=64$

C. $x^2+y^2=34$

D. $x^2+v^2=64$

ITEM 187

Parallelogram ABCD has coordinates A (0, 7) and C (2, 1). Which statement would prove that ABCD is a rhombus?

A. The midpoint of AC is (1,4).

B. BD = $\sqrt{40}$

C. The slope of BD = $\frac{1}{3}$.

D. The slope of AB = $\frac{1}{3}$.

ITEM 188

A quadrilateral with vertices A (1, 4), B (3, 8), C (7, 6), and D (5, 2). Which of the following is the most specific name of quadrilateral ABCD?

A. Parallelogram

B. Rhombus

C. Rectangle

D. Square

ITEM 189

A quadrilateral with vertices A (3, 1), B (0, 1), C (5, 2), and D (1, 2) is which of the following?

A. rhombus

B. rectangle

C. square

D. trapezoid

ITEM 190

The vertices of Triangle ABC are A (1 ,2), B (1, -2) and C (6,0). Which conclusion can be made about the angles of Triangle ABC?

A. $m\angle A = m\angle B$

B. $m\angle A = m\angle C$

C. $m\angle ACB = 90$

D. $m\angle ABC = 60$

ITEM 191

Triangle ABC has vertices A (0, 0), B (3, 2), and C (0, 4). Which of the following is the correct classification for triangle ABC?

A. equilateral

B. isosceles

C. right

D. scalene

ITEM 192

Which type of triangle can be drawn using the points (2, 3), (2, 7), and (4, 5)?

A. scalene

B. isosceles

C. equilateral

D. no triangle can be drawn

ITEM 193

A circle whose center is the origin passes through the point (5,12). Which point also lies on this circle?

A. (10, 3)

B. (-12, 13)

C. $(11, 2\sqrt{12})$

D. $(-8, 5\sqrt{21})$

ITEM 194

ΔMAX has coordinate M (-1, 2), A (7, 0), and X (1, -6). Point E (4, -3) lies on side AX.

Part A
Prove that Point E is the midpoint of AX by comparing distances AE and XE.

_____

_____

_____

Part B
Find the perimeter of ΔMAX. Give the perimeter as an exact answer.

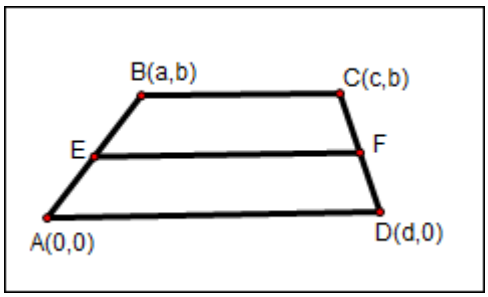
_____

_____

_____

ITEM 195

The coordinates of the vertices of ABCD are given in the diagram. Points E $\left(\frac{a}{2}, \frac{b}{2}\right)$ and F $\left(\frac{c+d}{2}, \frac{b}{2}\right)$ are the midpoints of $\overline{AB}$ and $\overline{DC}$. See the diagram below.



Part A

Prove that $\overline{EF}$ is parallel to both $\overline{AD}$ and $\overline{BC}$. Explain how you know.

_____

_____

_____

Part B

Prove that $EF = \frac{AC + BC}{2}$.

_____

_____

_____

Expressing Geometric Properties with Equations
G-GPE.B.5
Items 196 – 213

ITEM 196

Lauren graphed the linear equation 4*y* - 3*x*=16. She wants to graph a line that is parallel to her original line and passes through the point (8, 6).

Which of the following would meet those criteria?

A. $\frac{4}{3}y = x$

B. $y - \frac{3}{4}x = 3.5$

C. $-\frac{3}{4}y = x$

D. $y + \frac{4}{3}x = 5$

ITEM 197

The linear equation for a line that includes Segment RQ is $2x - y = -3$.

If the perpendicular bisector of segment RQ passes through the point (0,8), find the linear equation of the perpendicular bisector.

A. $y - 2x = 16$

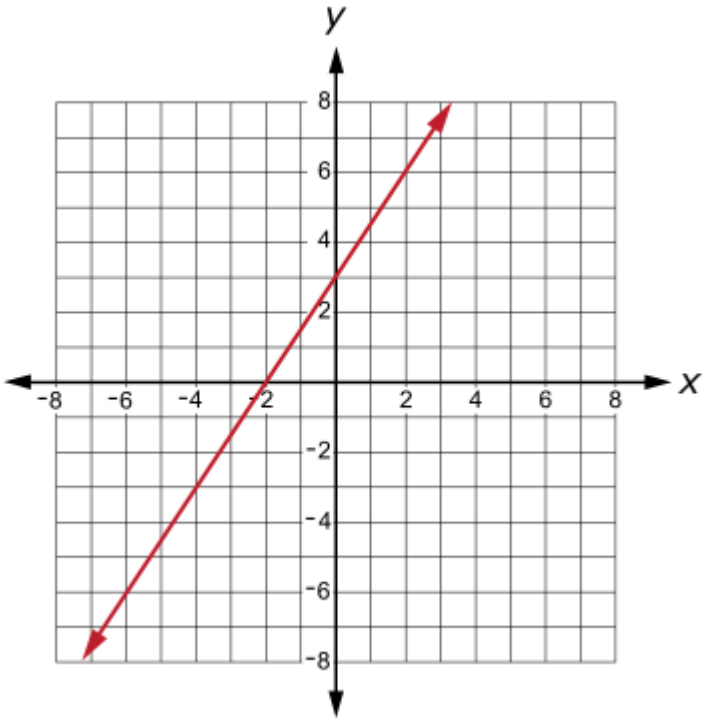
B. $2y + x = 16$

C. $2y + x = 8$

D. $y - 2x = 8$

ITEM 198

Use the graph to answer the question.



Nadia draws a line that is perpendicular to the line on the graph and goes through the point (–6, –2).

What is the equation of Nadia's line?

A. $y = -\frac{2}{3}x - 7\frac{1}{3}$

B. $y = -\frac{2}{3}x - 6$

C. $y = \frac{3}{2}x + 3$

D. $y = \frac{3}{2}x + 7$

ITEM 199

Ron graphed 4 different lines that all had the same slope. Which statement **correctly** describes Ron's lines?

A. None of the lines intersect each other.

B. Exactly 2 lines intersect each other.

C. Exactly 3 lines intersect each other.

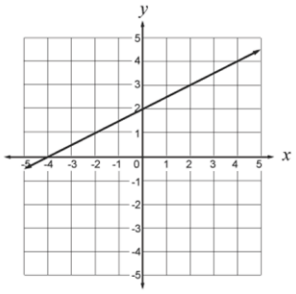
D. All of the lines intersect each other.

ITEM 200

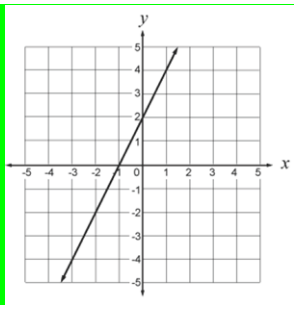
Line *a* contains the points (-4, -2) and (-1, 4). Line *b* is parallel to line *a* but contains the point (0, 2).

Which graph correctly shows line *b*?

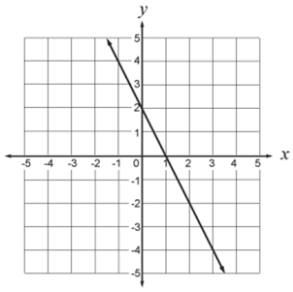
A.



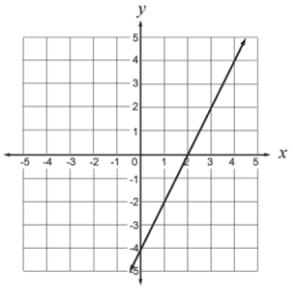
B.



C.

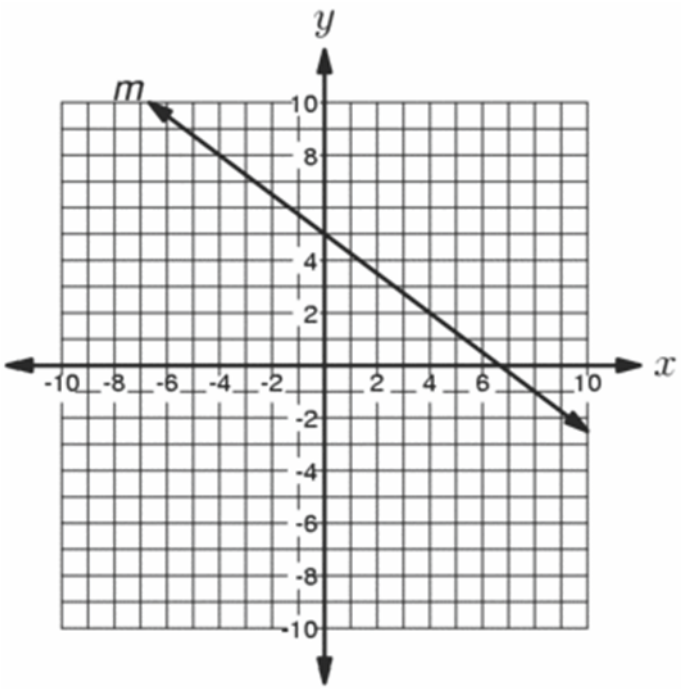


D.



ITEM 201

What is the equation of the line that is parallel to line *m* and passes through (8, -7)?



A. $y = -\frac{3}{4}x - 15$

B. $y = -\frac{3}{4}x - 1$

C. $y = \frac{4}{3}x - 15$

D. $y = \frac{4}{3}x - 1$

ITEM 202

Which equation represents a line that passes through (9, 5) and is perpendicular to this line?

$$y = \frac{1}{5}x + 3$$

A. $y = -5x + 50$

B. $y = -\frac{1}{5}x + 6\frac{4}{5}$

C. $y = \frac{1}{5}x + 3\frac{1}{5}$

D. $y = 5x - 40$

ITEM 203

The equation of line *k* is $= -\frac{1}{5}x - \frac{1}{8}$. What is the equation of the line that is perpendicular to line *k* and passes through (0, 0)?

A. $y = -8x$

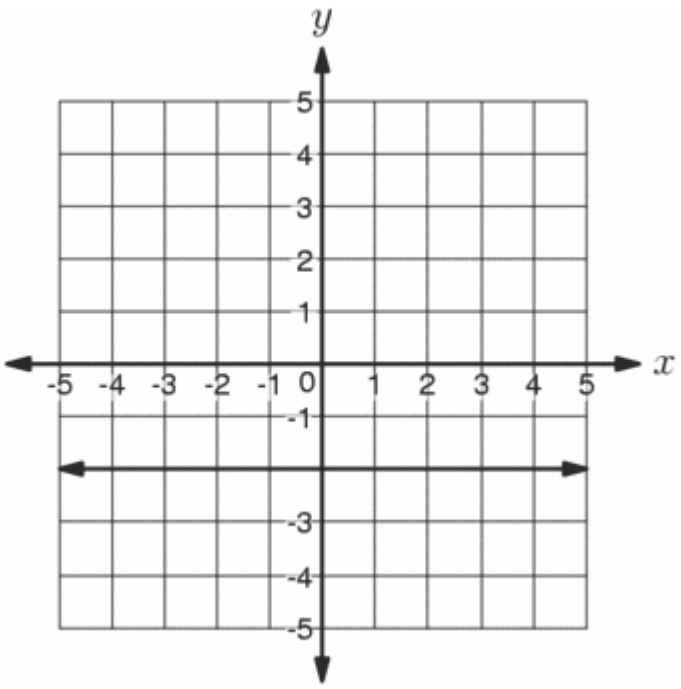
B. $y = -5x$

C. $y = 5x$

D. $y = 8x$

ITEM 204

This graph represents the path of a ball rolling on a table.



A second ball rolls on the table parallel to the first ball. The path passes through (-2, 1). What is the equation of the path of the second ball?

A. $y = 1$

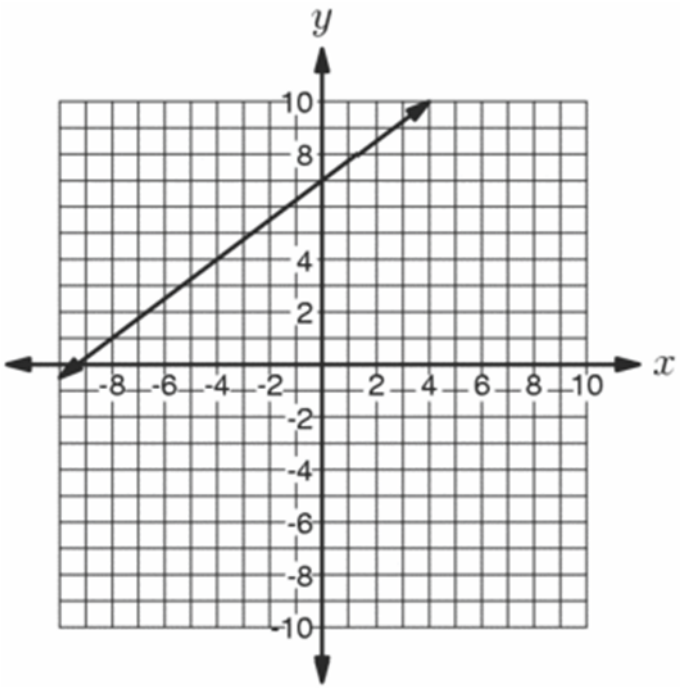
B. $y = -2$

C. $x = 1$

D. $x = -2$

ITEM 205

Mario drew this line.



He wants to draw a second line that is parallel to the first and passes through (4, -5). What is the equation of Mario's second line?

A. $y = \frac{3}{4}x - 8$

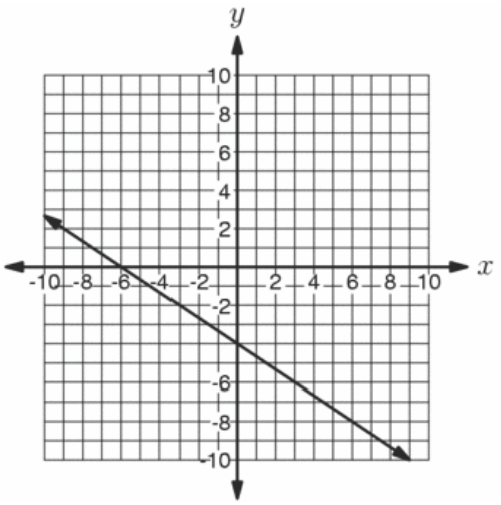
B. $y = \frac{3}{4}x + 8$

C. $y = -\frac{4}{3}x - \frac{1}{3}$

D. $y = -\frac{4}{3}x + \frac{1}{3}$

ITEM 206

What is the equation of the line that is perpendicular to this line and passes through (-6, -2)?



A. $y = -\frac{2}{3}x - 6$

B. $y = -\frac{2}{3}x - 2$

C. $y = \frac{3}{2}x - 4$

D. $y = \frac{3}{2}x + 7$

ITEM 207

Monica graphed the line $y = 3x + 2$. Janice graphs a second line that is parallel to Monica's and passes through (-2, 0). What is the equation of Janice's line?

A. $y = 3x + 6$

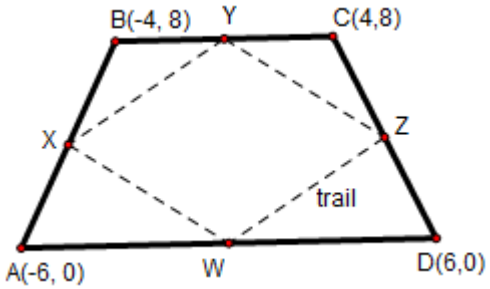
B. $y = 3x - 6$

C. $y = -\frac{1}{3}x - \frac{2}{3}$

D. $y = -\frac{1}{3}x + 2$

ITEM 208

The Parks Commission hired a landscape architect to design and construct a quadrilateral trail that connects the four sides of an isosceles trapezoid-shaped park, with all sides of the trail the same length. The landscape architect conjectured that if she designs the trail in the shape of a rhombus that connects the midpoints of the adjacent sides, the trail will satisfy the Park Commission's condition for the trail's design. Use the information on the figure below to prove the landscape architect's conjecture.



Part A
Prove that the 4 segments of the trail are equal in length.

_____

_____

_____

Part B
Determine that non-consecutive segments of the trail are parallel.

Enter your proof that the 4 segment are equal in length and your work to determine that the non-consecutive segments are parallel below.

_____

_____

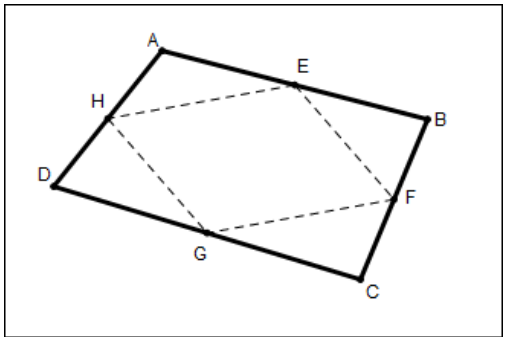
_____

ITEM 209

Quinn is studying properties of quadrilaterals. He graphed quadrilateral ABCD on a set of coordinate axes such that A (-3, -2), B (-5,4), C (5,6), and D (1, -4). He located the coordinates of the midpoints of each side of the quadrilateral's segments.

Midpoint E is located at (-4,1). Midpoint F is located at (0,5). Midpoint G is located at (3.1). Midpoint H is located at (-1, -3).

Quinn then connected the midpoints to create quadrilateral EFGH.



Part A
Quinn thinks that quadrilateral EFGH is a parallelogram. Prove or disprove Quinn's conjecture. Show all your work.

_____

_____

_____

Part B
Quinn wondered if quadrilateral EFGH is a rhombus. Prove that quadrilateral EFGH is or is not a rhombus. Show all your work. Enter your valid arguments, your answers, and work below.

_____

_____

_____

ITEM 210

The equation of the line that is perpendicular to the line $3x - 4y = 9$ and contains the point $(-4, -5)$ is which of the following?

A. $3x + 4y = -32$

B. $4x - 3y = -1$

C. $4x - 3y = -1$

D. $4x + 3y = -31$

ITEM 211

AB is parallel to CD. The coordinates of the endpoints of AB are A (-2, 1) and B (1, 2). Which of the following could the coordinates of the endpoints of CD?

A. C (-1, 3), D (0, 0)

B. C (2, 2), D (5, 1)

C. C (-1, 2), D (2, 3)

D. C (2, 2), D (1, -1)

ITEM 212

What is the distance between two lines whose equations are $y = -\frac{1}{4}x + 2$ and $y = -\frac{1}{4}x - \frac{9}{4}$?

A. $-\frac{17}{4}$

B. $\frac{17}{4}$

C. 4.123

D. -4.123

ITEM 213

$ADBC$ is a quadrilateral. Diagonal $\overline{AB}$ lies on $y = -x + 5$. Diagonal $\overline{CD}$ lies on $y = x - 1$. Which of the following is a term that can be used to describe quadrilateral $ADBC$?

A. Kite

B. Isosceles trapezoid

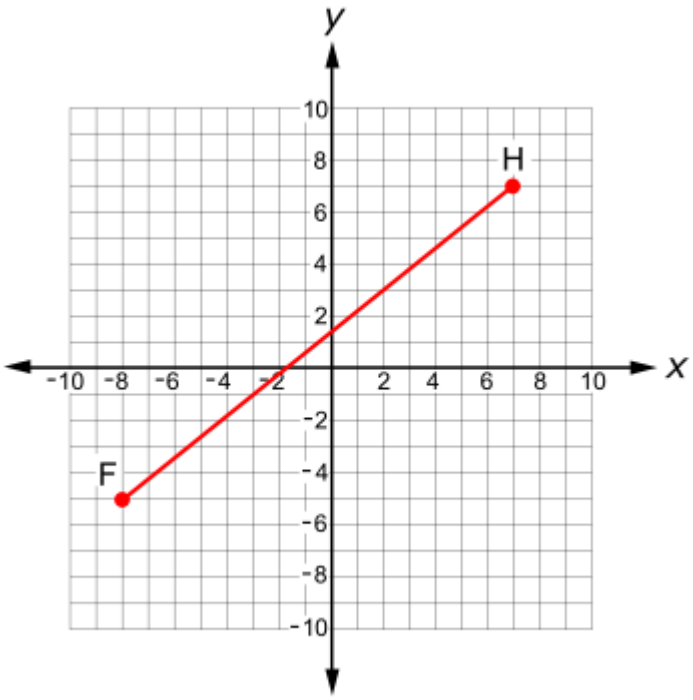
C. Rectangle

D. Parallelogram

Expressing Geometric Properties with Equations
G-GPE.B.6
Items 214 – 219

ITEM 214

Use the graph to answer the question.



Point *G* is drawn on the line segment so that the ratio of *FG* to *GH* is 5 to 1.

What are the coordinates of point *G*?

A. (4, 4.6)

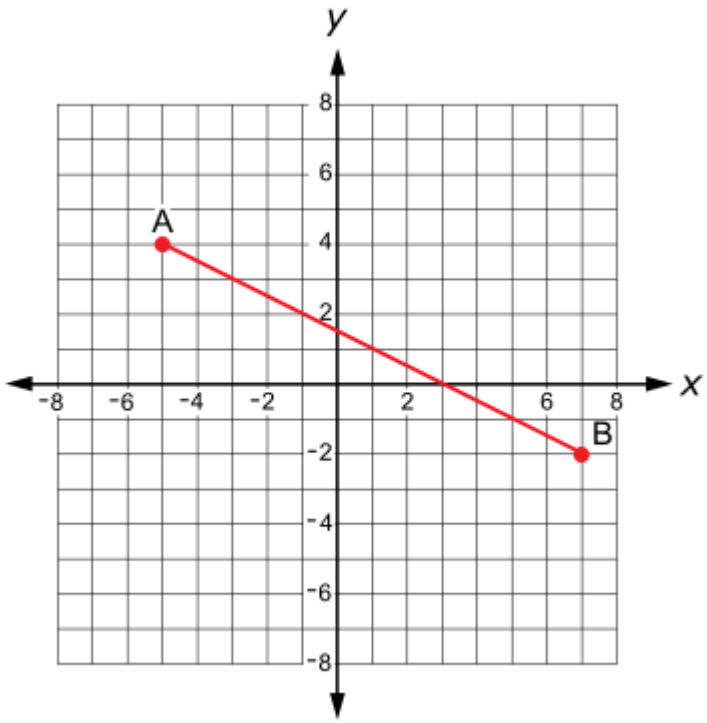
B. (4.5, 5)

C. (–5.5, –3)

D. (–5, –2.6)

ITEM 215

Line segment AB is shown on the graph.



Emily draws point C on the line segment so that the ratio of AC to CB is 3 to 1. What are the coordinates of point C?

A. (-2, 2.5)

B. (-1, 2)

C. (3, 0)

D. (4, -0.5)

ITEM 216

Point A is located at (-2, -3). Line segment AB is divided in the ratio 1:4 by the point C (1, 6).

Part A
Explain how to determine the *x* and *y* coordinates of the midpoint of AC. Be sure to include the coordinates in your answer.

_____

_____

_____

Part B
What are the coordinates of B? Show your work.

_____

_____

_____

ITEM 217

Point K is $\frac{1}{n}$ of the way from L(0, -7) to J(4, -5). The coordinates of K, for any natural number n, are which of the following?

A. $x = \frac{1}{n}\left|4 - 0\right|$ and $y = \frac{1}{n}\left|-5 - 7\right|$

B. $x = \frac{1}{n}\left|4 - 0\right|$ and $y = \frac{1}{n}\left|-5 + 7\right|$

C. $x = \frac{1}{n}\left|4 - 0\right| + 4$ and $y = \frac{1}{n}\left|-5 - 7\right| + 5$

D. $x = \frac{1}{n}\left|4 - 0\right|$ and $y = \frac{1}{n}\left|-5 + 7\right| - 7$

ITEM 218

Suppose PQ has one endpoint at P (0, 0). If T(6, 3) is a point $\frac{3}{10}$ of the way from P to Q, find the coordinates of Q.

A. (1.8, 0.9)

B. (20, 10)

C. (6.3, 3.3)

D. (7.8, 3.9)

ITEM 219

If A (3, -4) and B (13, 11). What are the coordinates of the point $\frac{3}{5}$ from A to B?

A. (5, 9)

B. $(9, 5\frac{1}{4})$

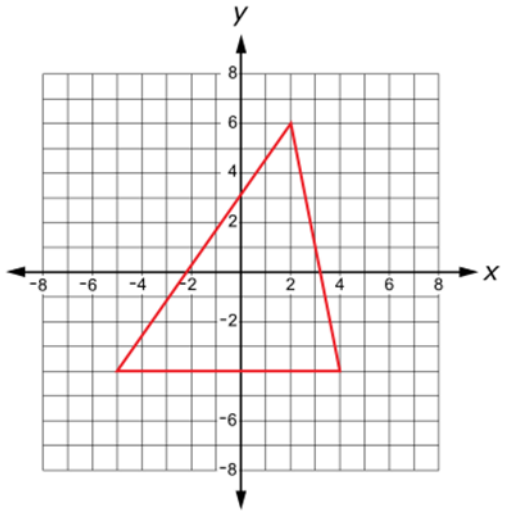
C. (9, 5)

D. (6, 9)

Expressing Geometric Properties with Equations
G-GPE.B.7
Items 220 – 223

ITEM 220

Use the graph to answer the question.



What is the perimeter of the triangle? Round to the nearest tenth.

A. 19.1

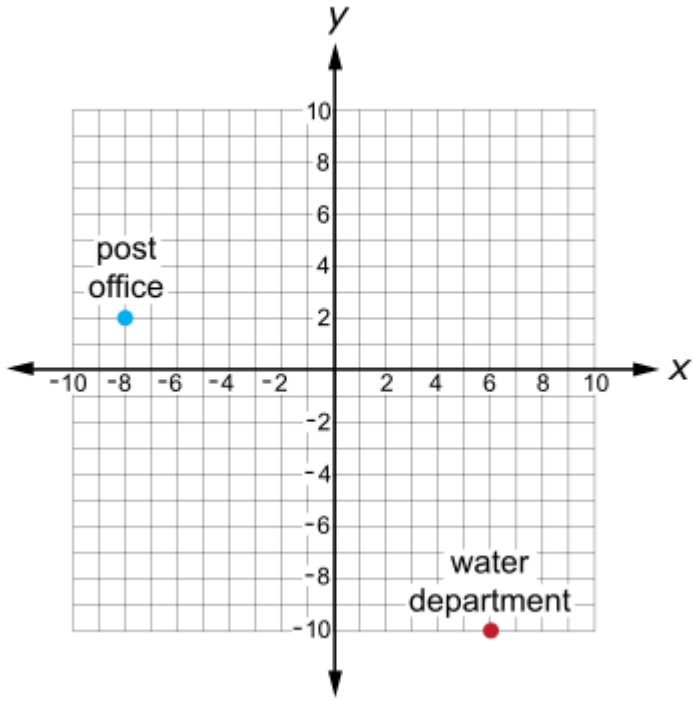
B. 22.4

C. 29.6

D. 31.4

ITEM 221

This map shows the locations of the post office and the water department.



The fire station is located at point (0, 0). If the post office, fire station, and water department were connected to form a triangle, what would be the perimeter of the triangle? Round your answer to the nearest tenth.

A. 11.7 units

B. 18.4 units

C. 22.9 units

D. 38.3 units

ITEM 222

Find the perimeter of the triangle defined by the coordinates (7, 1), (-6, 1), and (10, 6). Round the answer to the nearest tenth of a unit.

A. 32,6

B. 33.6

C. 34.6

D. 35.5

ITEM 223

The coordinates of the vertices of ΔABC are $A(-3,-1)$, $B(-1,3)$, $C(4,-1)$. Find the perimeter of ΔABC to the nearest tenth of a unit.

A. 17.9

B. 19.9

C. 16.5

D. 18.1

Geometric Measurement and Dimension
G-GMD.A.1
Items 224 – 227

ITEM 224

Carl knows that the area of a given circle is 400 cm^2. He wants to defend an informal argument that the area of a circle can be approximated by dividing the circle into congruent segments, rearranging the segments to resemble a parallelogram, and replacing the dimensions of the parallelogram with appropriate values from the circle. Carl divides the circle into 6 congruent segments and makes his calculations, but the area he calculates for the circle is only 350 cm^2. How could Carl defend his informal argument?

A. There is too great a difference between Carl's calculated value using the informal argument approach and the actual area of the circle. Carl should realize that his informal argument cannot be defended**.**

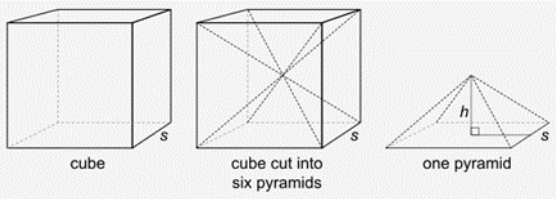
B. Carl could divide the circle into a larger even number of congruent sectors. Then each sector would be smaller, and the approximation of the circle's area will be closer to the actual area of the circle.

C. Carl could arrange the sectors of the circle into the shape of a trapezoid instead of into the shape of a parallelogram, and replace the dimensions of the trapezoid with appropriate values from the circle.

D. Carl could divide the circle into a smaller even number of congruent sectors. Then, each sector would be larger, and the approximation of the circle's area will be closer to the actual area of the circle.

ITEM 225

Use the figures to answer the question.



Sasha derived the formula for the volume of a square pyramid. She started by dividing a cube into 6 identical square pyramids. The top vertex of each pyramid meets at the central point in the cube, with the cube's diagonals as the edges.

V = the volume of a pyramid; s = side length of base, h = height of pyramid

The steps of Sasha's work are shown.

Step 1: $6V = s^3$

Step 2: $V = \frac{1}{6} s^3$

Maggie also derived the formula for volume of a square pyramid. Maggie's result is $V = \frac{1}{3} s^2 h$.

The formulas derived by Sasha and Maggie can both be used to correctly calculate the volume of a square pyramid.

What are the best next steps for Sasha to take to prove that either formula can be used to find the volume of a square pyramid?

A.

Step 3	$2h = s$
Step 4	$V = \frac{1}{6}(2h)^3$
Step 5	$V = \frac{1}{3}8h^3$

C.

Step 3	$2s = h$
Step 4	$s = \frac{1}{2}h$
Step 5	$V = \frac{1}{6}s^2(s)$
Step 6	$V = \frac{1}{6}s^2\left(\frac{1}{2}h\right)$

B.

Step 3	$2h = s$
Step 4	$V = \frac{1}{6}s^2(s)$
Step 5	$V = \frac{1}{6}s^2(2h)$

D.

Step 3	$2s = h$
Step 4	$s = \frac{1}{2}h$
Step 5	$V = \frac{1}{6}\left(\frac{1}{2}h\right)^3$
Step 6	$V = \frac{1}{6}\left(\frac{1}{8}\right)h^3$

ITEM 226

Complete the following statement using the choices below:
Cavlieri's Principle is_____

A. a formula for calculating the volumes of cylinders, cones, pyramids, and prisms.

B. a procedure for calculating the volume of cylinders, cones, pyramids, and prisms when the height is unknown.

C. a theorem about shapes of equal volume must have the same height.

D. a theorem about shapes of equal cross-sectional areas and heights have equal volumes.

ITEM 227

According to Cavlieri's Principle, which of the following pair of shapes have equal volumes?

A. A cone and a cylinder with equal base areas and heights.

B. A cylinder and a sphere with the same radius.

C. A cone and a pyramid with equal base areas and heights.

D. A cylinder and a right rectangular

Geometric Measurement and Dimension
G-GMD.A.3
Items 228 – 234

ITEM 228

A square pyramid and a cone have the same base area. The volume of the cone is 100 cm^3, and the height of the cone is 15 cm. The height of the square pyramid is 24 cm.

Find the volume of the square pyramid to the nearest whole unit.

A. 144 cm^3

B. 160 cm^3

C. 480 cm^3

D. 2400 cm^3

ITEM 229

A square prism and a square pyramid have the same base area (*B*), but the height of the square pyramid is twice the height of the prism.

If *h* represents the height of the prism, find the formula that could be used to calculate the volume of the square pyramid.

A. $V = Bh$

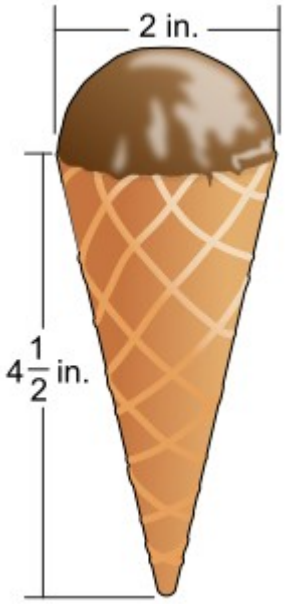
B. $V = 2hB$

C. $V = \frac{1}{3}Bh$

D. $V = \frac{2}{3}Bh$

ITEM 230

Use the diagram of the ice cream cone to answer the question.



The cone is completely filled with ice cream. There is a half sphere of ice cream on top. What is the total volume of ice cream in cubic inches?

A. 6.8

B. 8.9

C. 35.6

D. 52.4

ITEM 231

A cone has a height of 45 centimeters and a radius of 6 centimeters. What is the **best** estimate for the volume of the cone?

A. 300 cubic centimeters

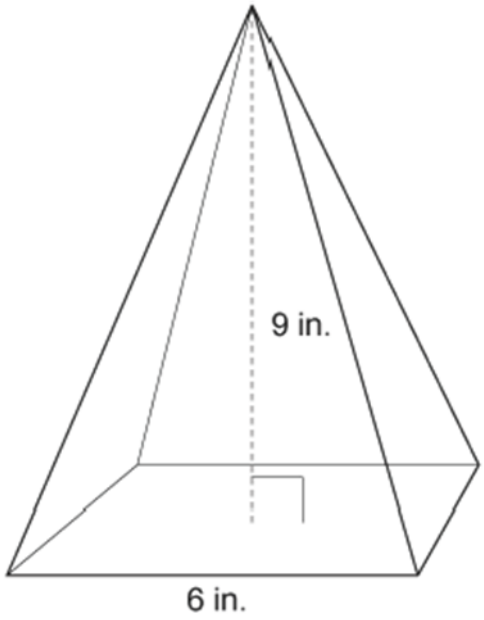
B. 600 cubic centimeters

C. 1,700 cubic centimeters

D. 4,200 cubic centimeters

ITEM 232

What is the volume of this square pyramid?



A. 18 cubic inches

B. 54 cubic inches

C. 108 cubic inches

D. 324 cubic inches

ITEM 233

A waffle cone for ice cream has a diameter of 8 centimeters and a height of 12 centimeters. What is the volume of the cone, in cubic centimeters?

A. 32π cubic centimeters

B. 64π cubic centimeters

C. 192π cubic centimeters

D. 256π cubic centimeters

ITEM 234

A spherical marble has a diameter of 2 centimeters. What is the volume of the marble?

A. $\frac{4}{3}\pi$ cubic centimeters

B. 4π cubic centimeters

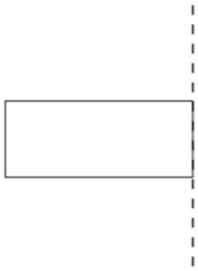
C. 8π cubic centimeters

D. $\frac{32}{3}\pi$ cubic centimeters

Geometric Measurement and Dimension
G-GMD.B.4
Items 235 – 241

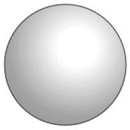
ITEM 235

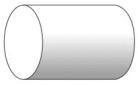
Use the diagram to answer the question.

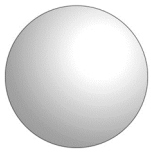


The rectangle is rotated around the dashed line.

What three-dimensional shape shows the path of this rotation?

A. 

B. 

C. 

D. 

ITEM 236

A plane intersects a cone such that the plane is parallel to the base of the cone. Which conic section is formed by this intersection?

A. a line

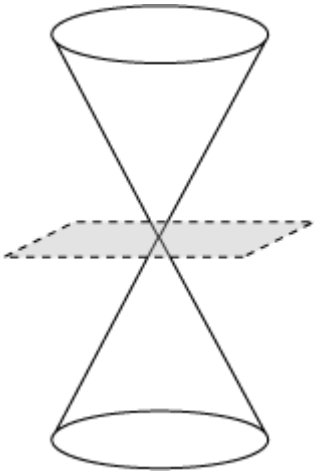
B. a circle

C. an ellipse

D. a parabola

ITEM 237

A plane intersects this double cone in the center.



What is the **best** description of the intersection?

A. a point

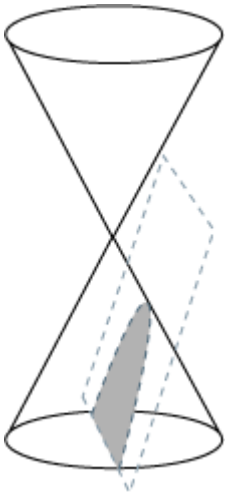
B. a circle

C. an ellipse

D. a parabola

ITEM 238

What is the name of the conic section shown by the shaded region?



A. circle

B. ellipse

C. parabola

D. hyperbola

ITEM 239

Claude has a piece of cheese in the shape of a cone. He uses a straight cut to slice off a smaller piece. Which shape could be one of the faces of Claude's smaller piece of cheese?

A. ellipse

B. square

C. pentagon

D. parallelogram

ITEM 240

Which shape could **not** be the intersection of a cone and a plane?

A. circle

B. ellipse

C. parabola

D. rectangle

ITEM 241

Which three-dimensional figure could have a rectangular cross-section?

A. cone

B. cylinder

C. tetrahedron

D. pentagonal pyramid

Modeling with Geometry
G-MG.A.1
Items 242 – 248

ITEM 242

A pine tree farmer wants to estimate the volume of wood in his pine trees. If his average tree has a 3 foot diameter base, is 60 feet tall, and tapers to a diameter of 2 inches near the top, which of the following would be used to model the tree?

A. cone

B. cylinder

C. square pyramid

D. rectangular prism

ITEM 243

Use the diagrams to answer the question.

Diagram 1: Side view of City Park Pond

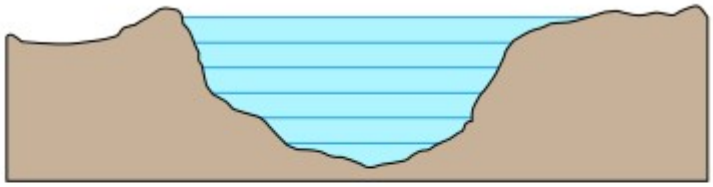
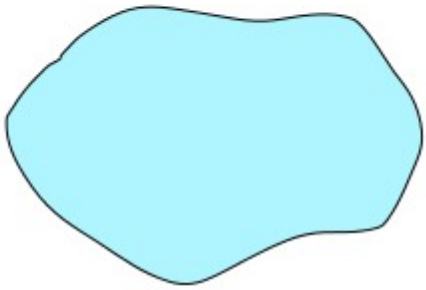


Diagram 2: Top view of City Park Pond



Based on the two diagrams shown, which formula would be **best** to use to estimate the volume of City Park Pond?

A. $V = \pi r^2 h$

B. $V = \frac{2}{3}\pi r^3$

C. $V = \frac{1}{3}Bh$

D. $V = \frac{1}{3}\pi r^2 h$

ITEM 244

Which of the following formulas would be most appropriate to calculate the volume of a water hose?

A. r^2h

B. lwh

C. $(4/3)\ r^3$

D. $(1/3)\ r^2h$

ITEM 245

The trunk of a pine tree will be cut up to make boards.

- The trunk is 52 feet long.
- The base of the trunk is a circle 1.5 feet across.
- The trunk tapers gradually to a point at the top.

Which expression best models the volume of the trunk?

A. $\pi \cdot 0.75^2 \cdot 52$

B. $\pi \cdot 1.5^2 \cdot 52$

C. $\frac{1}{3} \cdot \pi \cdot 0.75^2 \cdot 52$

D. $\frac{1}{3} \cdot \pi \cdot 1.5^2 \cdot 52$

ITEM 246

Timmie just finished a roll of paper towels. What shape is the paper towel roll?

A. a cone

B. a sphere

C. a cube

D. a cylinder

ITEM 247

Mr. Jones is trying to use a geometric shape to describe a tree trunk. Which shape would best describe a tree trunk?

A. a cylinder

B. a sphere

C. a cube

D. a cone

ITEM 248

Bob is trying to describe a sphere to his little brother. Bob decides to go through his toys to find examples of spheres. Which of the following would **not** be a good representation of a sphere?

A. a basketball

B. a baseball

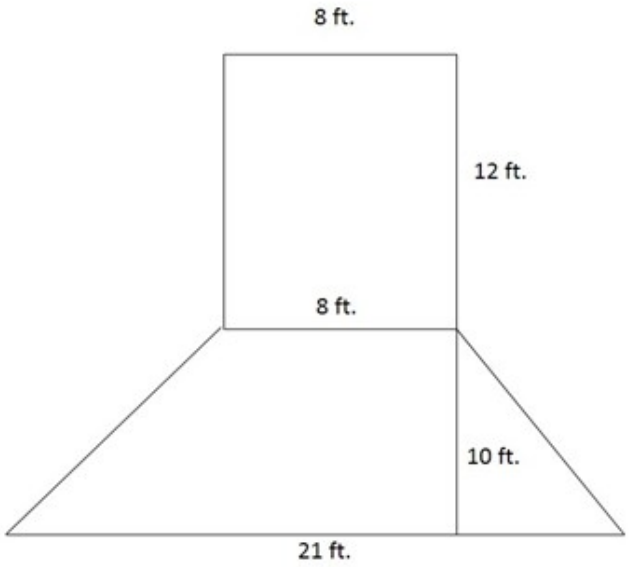
C. a tennis ball

D. a football

Modeling with Geometry
G-MG.A.2
Items 249 – 257

ITEM 249

A diagram for the entry chute to a stadium is shown below. Assume that all segments that appear to be parallel are parallel and that all segments that appear to be perpendicular are perpendicular.



To determine the maximum occupancy of the chute, the fire department requires chute designers to allow 0.75 feet^2 for each person in the chute. Which of the following would be the maximum occupancy of the chute at any given moment?

A. 181 persons

B. 235 persons

C. 321 persons

D. 408 persons

ITEM 250

A small rectangular pyramid-shaped metal object made of a single metal is found in an archaeological dig. Because of the metals available to the area's inhabitants at the time, scientists believe the metal could be either iron, lead, nickel, or silver. The weight of the object is 612.4 grams. The rectangular base of the pyramid is 3 cm by 6 cm and the height is 9 cm. The density for each metal is shown below:

Iron: 7.874 grams/cm ^{3}

Lead: 11.34 grams/cm ^{3}

Nickel: 8.908 grams/cm ^{3}

Silver: 10.49 grams/cm ^{3}

Select the metal shown below that was used to construct the small rectangular pyramid-shaped metal object found in the archaeological dig.

A. iron

B. lead

C. nickel

D. silver

ITEM 251

Mr. Sanchez owns a square field. The side lengths are 0.9 kilometers. There are 1,980 prairie dog burrows in the field. What is the approximate density of prairie dog burrows in burrows per square kilometer?

A. 1,604

B. 1,782

C. 2,200

D. 2,444

ITEM 252

The density of platinum is 21.30 $\frac{g}{cm^3}$. Using 3.14 as an approximation for π, find the mass of a solid cone of platinum with a height of 21 cm and a diameter of 8 cm. Give the answer to the nearest 10^{th} of a gram.

A. 0.1 grams

B. 2385.6 grams

C. 22472.4 grams

D. 7490.8 grams

ITEM 253

When you put a rock into a container of water, it raises the water level 3 cm. If the container is a rectangular prism whose base measure 15 cm by 15 cm, what is the mass of the rock to the nearest 100^{th} of a gram?

A. 0.01 grams

B. 3.00 grams

C. 675.00 grams

D. Not enough information is provided to compute the mass of the rock.

ITEM 254

In 2017, the population of Alaska was 73,795 people. With an area of 663,300 square miles, this makes Alaska the state with the lowest population density. However, over 90% of the land in Alaska is protected federal property that is off-limits to settlement. If Alaska's population density is adjusted to include only the land area available for human settlement, what is the adjusted population density of Alaska to the nearest 100^{th}?

A. 0.01 persons per square mile

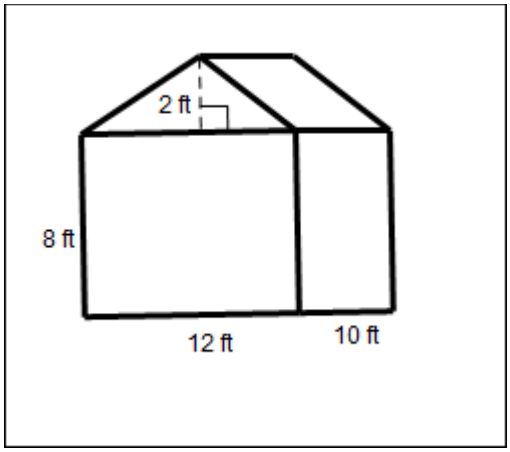
B. 0.11 persons per square mile

C. 0.12 persons per square mile

D. 1.11 persons per square mile

ITEM 255

Ben is building a workshop in his backyard with dimensions as shown in the figure. Ben is planning to air-condition the workshop using a window-unit air conditioner. He needs to determine the BTU's (British Thermal Units) required to cool the building. For a new construction with good insulation, there should be 2 BTU per cubic foot. What is the minimum capacity for the window air conditioner that Ben need to purchase?



A. 1080 BTU

B. 540 BTU

C. 2160 BTU

D. 1920 BTU

ITEM 256

A butterfly house at a local zoo is cylindrical shape and contains 625 butterflies. The butterfly house has a height of 10 feet & base diameter of 120 inches. Assuming that the butterflies are equally distributed inside the butterfly house, what is the density of the butterflies to the nearest 1000^{th}?

A. 0.001 butterflies per cubic foot.

B. 0.005 butterflies per cubic foot.

C. 0.199 butterflies per cubic foot.

D. 0.796 butterflies per cubic foot.

ITEM 257

A clump of metal with mass 351.4 gram is dropped into a graded cylindrical container that is partially filled with water causing the water to rise 1.1 cm. If the radius of the container is 3.0 cm, what is the density of the metal to the nearest 10^{th} of a gram?

A. $11.3 \frac{g}{cm^3}$

B. $35.49 \frac{g}{cm^3}$

C. $106.5 \frac{g}{cm^3}$

D. $1107.9 \frac{g}{cm^3}$

Modeling with Geometry
G-MG.A.3
Items 258 – 269

ITEM 258

Juan wants to build a greenhouse in his back yard. He needs to maximize the ratio of floor area to structure volume in order to provide the most room for plants while minimizing the area to be heated.

Find the description of the structure that best meets Juan's criteria.

A. A hemisphere with a diameter of 12 feet

B. A cube with a side length of 12 feet

C. A cone with a diameter of 12 feet and a height of 10 feet

D. A square pyramid with a base side length of 12 feet and a height of 9 feet

ITEM 259

Brittany has designed four different birdcages, each with the same volume: a square pyramid, a cylinder, a cone, and a sphere. The zoo wants to use one of Brittany's designs but plans to change the volume of the cage.

Find the design change that would result in the birdcage with the greatest volume.

A. Increase the area of the base of the square pyramid by a factor of ten.

B. Increase the height of the cylinder by a factor of ten.

C. Increase the radius of the cone by a factor of ten.

D. Increase the radius of a sphere by a factor of ten.

ITEM 260

If the base of a triangle is represented by x + 4 and the height is represented by 2x, which expression represents the area of the triangle?

A. (x + 4) + (2x)

B. (x + 4) (2x)

C. $\frac{1}{2}$((x + 4) + 2x)

D. $\frac{1}{2}$(x + 4) (2x)

ITEM 261

What is the length, in feet, of one side of a square garden whose area is 48 square feet?

A. $12\sqrt{2}$

B. $4\sqrt{3}$

C. $16\sqrt{3}$

D. $4\sqrt{6}$

ITEM 262

A farmer has 64 feet of fence to enclose a rectangular vegetable garden. Which dimensions would result in the biggest area for this garden?

A. The length and the width are equal

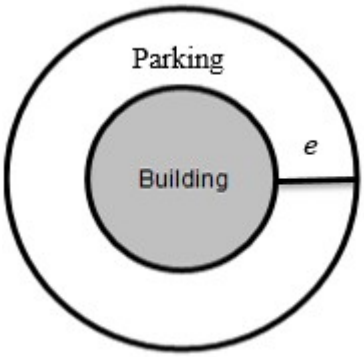
B. The length is 2 more than the width

C. The length is 4 more than the width

D. The length is 6 more than the width

ITEM 263

City law requires that any one-story commercial building supply a parking area that has an area that is two times the area of the floor of the building. A-Round Architects has designed a cylindrical building with 150-foot diameter floor. They plan to ring the building with a circular parking lot as shown. To the nearest foot, how far from the building, *e*, should the parking lot extend?



Write and solve an equation or equations to find *e*. Show all your work.

Enter your equation(s), your work, and your answer below.

_____

_____

_____

ITEM 264

What is the largest hemisphere that you could carve out of a wooden block whose edges measure 3 meters by 7 meters by 7 meters?

A. $\frac{9\pi}{2}$ cubic meters

B. 18π cubic meters

C. 36π cubic meters

D. $\frac{343\pi}{12}$ cubic meters

ITEM 265

The volume of a spherical hot air balloon is 36 cubic meters. The burner was turned on to heat the gas trapped in the balloon. The heated gas in the balloon expanded so that the radius of the hot air balloon is now twice the original radius. What is the ratio of the new volume of the hot air balloon to its original volume?

A. 2:1

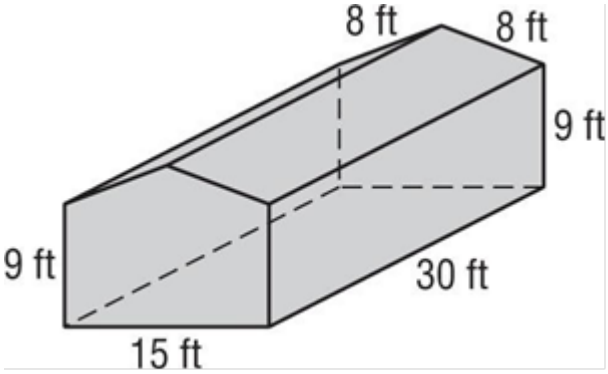
B. 4:3

C. 3:4

D. 8:1

ITEM 266

Ralph is building a greenhouse to grow tomatoes during the winter for sale as shown in the figure. He plans to cover the top and the two sides with glass. For ease of access, he plans to cover the front and back with plastic sheets. The glass costs $2.25 per square yard.



Find the cost of the glass needed to cover the top and the sides of the greenhouse.

A. $255.00

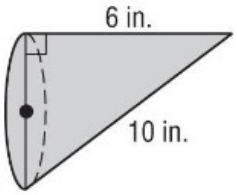
B. $765.00

C. $1147.50

D. $2295.00

ITEM 267

Which of these is the approximate volume of the oblique cone? Values have been rounded to the nearest tenth.



A. 100.5 cubic inches

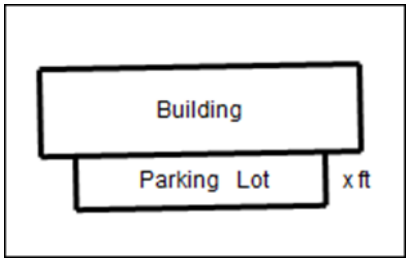
B. 401.6 cubic inches

C. 669.9 cubic inches

D. 1205.8 cubic inches

ITEM 268

A company wants to fence in its rectangular-shaped parking lot located behind its building as shown in the figure below. The company purchased 800 feet of fencing to use along three sides of the parking lot. The side along the building needs no fence. The shorter side is of the parking lot measure *x* feet.



Part A

Write an equation for the area of the parking lot, $A(x)$, in terms the length of the shorter side, *x.*

_____

_____

_____

Part B

Use the equation for area, $A(x)$, to find the measure of the short side, *x*, when the area is 80,000 square feet. Show all steps used to find *x*.

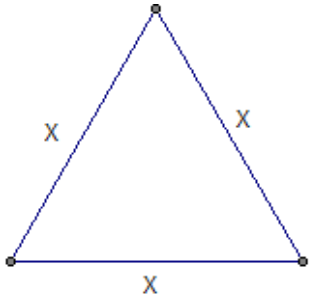
_____

_____

_____

ITEM 269

Joe is going to create a stained glass project in the shape of an equilateral triangle as shown below.



Determine the height of Joe's triangle in terms of x. Use the height to find a formula for the triangle's area.

Joe estimates that he has 30 square inches of stained glass material. What is the maximum side length, to the nearest inch, can Joe use if his estimate is correct?

Provide your responses below.

_____

_____

_____

Conditional Probability and the Rules of Probability
G-CP.A.1
Items 270

ITEM 270

A six-sided number cube has numbers 1, 2, 3, 4, 5 and 6. Which of the following is another way to describe the event of rolling an even number?

A. rolling a 2 or 4

B. rolling a 2 and 4 and 6

C. rolling a 1 or 3 or 5

D. not rolling a 1 or 3 or 5

Conditional Probability and the Rules of Probability
G-CP.A.2
Item 271

ITEM 271

Given these probabilities:

P (A) = (1/ 2), P (B) = (1/ 3), P (C) = (1/ 4), P (A and B) = (1/ 3), P (A and C) = (1/ 6), P (B and C) = (1/ 12)

Which pair of events represents independent events?

A. *A* and *B*

B. *A* and *C*

C. *B* and *C*

D. not enough information provided to determine independence

Conditional Probability and the Rules of Probability
G-CP.A.3
Items 272 – 245

ITEM 272

The cafeteria manager surveys 100 randomly selected high school students to see if they would prefer a traditional Thanksgiving meal on the Friday before Thanksgiving or if they would prefer a hamburger and fries. Twenty-eight of the students surveyed are Juniors, and ten Juniors voted for a traditional meal. Sixty-one total students voted for the traditional meal.

Which of the following statements about the independence of Juniors and selecting the traditional meal is most accurate?

A. Being a Junior and food selection are independent events because $\frac{10}{100} \neq \frac{28}{61}$..

B. Being a Junior and food selection are independent events because $\frac{10}{61} \neq \frac{28}{100}$.

C. Being a Junior and food selection are not independent events because $\frac{10}{100} \neq \frac{28}{61}$.

D. Being a Junior and food selection are not independent events because $\frac{10}{61} \neq \frac{28}{100}$.

ITEM 273

A researcher is investigating a possible link between diabetes and leukemia. She collected data from 113,572 people without diabetes and from 52,421 people with diabetes. The researcher was specifically looking for a large number of people with diabetes; therefore, the number of people with and without diabetes cannot be used to determine the prevalence of diabetes. Out of the 113,572 people without diabetes, 13 had been diagnosed with leukemia. Out of the people with diabetes, 6 had been diagnosed with leukemia. Based on this information, which of the following statements is true?

A. Diabetes and leukemia appear to be independent because $\frac{6}{52{,}421} \approx \frac{19}{165{,}993}$.

B. Diabetes and leukemia are not independent because one group had 13 people with leukemia and the other only had 6 people with leukemia.

C. Diabetes and leukemia are not independent because $\frac{13}{165{,}993} \neq \frac{6}{113{,}572}$.

D. There is not enough information given to determine if diabetes and leukemia are independent.

ITEM 274

If two events are independent, which of the following is true?

A. They must be mutually exclusive.

B. The sum of their probabilities must be equal to one.

C. They do not have elements which are the same.

D. The probability that both events occur must be zero.

ITEM 275

You are looking for a full-time day job for the summer. You are considering a full-time day job as a stock clerk at a hardware store or a full-time day job as a cashier at a grocery store.
Choose the answer that best describes your choice of a full-time day job for the summer.

A. These two choices are considered to be mutually exclusive events.

B. These two choices are considered to be dependent events.

C. These two choices are considered to be independent events.

D. The two choices are considered to be disjoint events.

Conditional Probability and the Rules of Probability
G-CP.A.4
Items 276 - 279

ITEM 276

At your high school, some members of 3 high school clubs: Beta, Key, and SGA, are also team members of 3 high school sports: Archery, Bowling, and Golf. The table shows the distribution of members of the three clubs that participate in these sports.

CLUB	SPORT: Archery	Bowling	Golf	TOTAL
Beta	6	4	4	14
Key	8	5	7	20
SGA	5	7	4	16
TOTAL	19	16	15	50

If a member of one of the three clubs who is also on one of the three sports teams is randomly selected, what is the probability that the member selected is on the Golf team given that she a member of Key Club?

A. $\frac{7}{50}$

B. $\frac{20}{50}$

C. $\frac{15}{20}$

D. $\frac{7}{20}$

ITEM 277

At your high school, some members of 3 high school clubs: Beta, Key, and SGA, are also team members of 3 sports: Archery, Bowling, and Golf. The table shows the distribution of members of the three clubs that participate in these sports.

CLUB	SPORT: Archery	Bowling	Golf	TOTAL
Beta	6	4	4	14
Key	8	5	7	20
SGA	5	7	4	16
TOTAL	19	16	15	50

If a member of one of the three clubs who is also on one of the three sports teams is randomly selected, what is the probability that the member selected was from Beta Club given she is on the Golf Team?

A. $\frac{7}{50}$

B. $\frac{7}{20}$

C. $\frac{4}{15}$

D. $\frac{20}{50}$

ITEM 278

At your high school, some members of 3 high school clubs: Beta, Key, and SGA, are also team members of 3 sports: Archery, Bowling, and Golf. The table shows the distribution of members of the three clubs that participate in these sports.

CLUB	SPORT: Archery	Bowling	Golf	TOTAL
Beta	6	4	4	14
Key	8	5	7	20
SGA	5	7	4	16
TOTAL	19	16	15	50

If a member of one of the three clubs who is also on one of the three sports teams is randomly selected, what is the probability that the member selected was from Key club given she is on the Golf Team?

A. $\frac{7}{50}$

B. $\frac{7}{20}$

C. $\frac{7}{15}$

D. $\frac{20}{50}$

ITEM 279

At your high school, some members of 3 high school clubs: Beta, Key, and SGA, are also team members of 3 sports: Archery, Bowling, and Golf. The table shows the distribution of members of the three clubs that participate in these sports.

CLUB	SPORT: Archery	Bowling	Golf	TOTAL
Beta	6	4	4	14
Key	8	5	7	20
SGA	5	7	4	16
TOTAL	19	16	15	50

If a member of one of the three clubs who also was on one of the three sports teams is randomly selected, what is the probability that she is a member of Key Club and the Golf Team?

A. $\frac{7}{50}$

B. $\frac{7}{20}$

C. $\frac{7}{15}$

D. $\frac{20}{50}$

Conditional Probability and the Rules of Probability
G-CP.A.5
Item 280

ITEM 280

Five hundred randomly selected Louisiana high school graduates who played football were surveyed and asked if they had sustained a concussion while playing football in high school. Of those surveyed, 214 players reported having sustained a concussion at some point during high school.
Which of the following statements is true based on this data?

A. A randomly selected Louisiana high school graduate who played football has approximately a 42.8% chance of having sustained a concussion in high school while playing football.

B. A randomly selected Louisiana high school graduate who has sustained a concussion has approximately a 42.8% chance of having been a football player in high school.

C. Exactly 42.8% of all high school graduates who played football in Louisiana have sustained a concussion.

D. Exactly 42.8% of all high school graduates in Louisiana have sustained a concussion.

Conditional Probability and the Rules of Probability
G-CP.B.6
Items 281 – 283

ITEM 281

The cafeteria manager surveys 100 randomly selected high school students to see if they would prefer a traditional Thanksgiving meal on the Friday before Thanksgiving or if they would prefer a hamburger and fries. Twenty-eight of the students surveyed are Juniors, and ten Juniors voted for a traditional meal. Sixty-one total students voted for the traditional meal.

If a randomly selected student from the school chose the hamburger and fries, what is the probability that the student is **not** a Junior?

A. $\frac{72}{100}$

B. $\frac{39}{100}$

C. $\frac{21}{39}$

D. $\frac{21}{72}$

ITEM 282

A fair six-sided number cube (numbered 1-6) is rolled. If the number rolled is greater than 2, what is the probability that the number rolled is less than 5?

A. (4/ 6)

B. (2/ 6)

C. (4/ 5)

D. (2/ 4)

ITEM 283

A fair six-sided number cube (numbered 1-6) is rolled. If you know that the number rolled is odd, what is the probability that it is either a 3 or a 5?

A. (1/ 6)

B. (2/ 6)

C. (2/ 3)

D. (2/ 2)

Conditional Probability and the Rules of Probability
G-CP.B.7
Items 284 – 288

ITEM 284

The cafeteria manager surveys 100 randomly selected high school students to see if they would prefer a traditional Thanksgiving meal on the Friday before Thanksgiving or if they would prefer a hamburger and fries. Twenty-eight of the students surveyed are Juniors, and ten Juniors voted for a traditional meal. Sixty-one total students voted for the traditional meal.

If a student from the school is selected at random, what is the probability that the student is either a Junior or prefers a traditional Thanksgiving meal?

A. 0.61

B. 0.79

C. 0.89

D. 0.99

ITEM 285

The Probability Rule P (A or B) = P(A) + P(B) – P (A and B) is used to compute the probability of either event A or event B occurring.

The reason that P (A and B) subtracted is which of the following?

A. There is no explanation other than it's just a part of the theory.

B. You do not have to subtract P (A and B) if A and B are independent events.

C. P (A and B) would be counted twice through P(A) and P(B).

D. This rule determines the probability of event A or B occurring, not A and B, so this factor is subtracted.

ITEM 286

The Probability Rule P (A or B) = P(A) + P(B) – P (A and B) is used to compute the probability of either event A or event B occurring.

If event A and event B are independent and P(A) = 0.2 and P(B) = 0.1, then P (A or B) is which of the following?

A. 0.02

B. 0.28

C. 0.30

D. 0.32

ITEM 287

Amaya is gathering data on the Junior Class at her school. She finds that 60% of the Juniors have black hair, 20% have brown eyes, and 5% of the Juniors with black hair also have brown eyes. What is the probability that a randomly selected Junior will be have black hair or brown eyes?

A. 45%

B. 25%

C. 55%

D. 75%

ITEM 288

Tickets numbered 1 to 20 are mixed up and then a ticket is drawn at random. What is the probability that the ticket drawn has a number which is a multiple of 3 or 5?

A. $\frac{1}{2}$

B. $\frac{2}{5}$

C. $\frac{3}{50}$

D. $\frac{9}{20}$