Geometry

Form H

H

North Carolina Test of Geometry

NCDPI

North Carolina Test of Geometry. Form H RELEASED Fall 2009

1. What is the *approximate* area of a 70° sector of a circle with a radius of 8 inches?

    A   5 in.^{2}

    B   10 in.^{2}

    C   39 in.^{2}

    D   156 in.^{2}

2. $\overline{JK}$ and $\overline{LM}$ are perpendicular diameters of a circle. They are each 12 inches long. What is the *approximate* length of chord $\overline{LK}$?

    A   17 in.

    B   12 in.

    C   10.4 in.

    D   8.5 in.

3. A rectangle contains two inscribed semicircles and a full circle, as shown below.
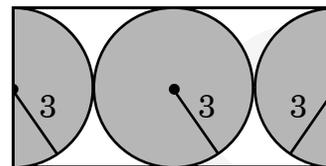

    If a point is chosen at random inside the rectangle, what is the *approximate* probability that the point will also be inside the shaded region?

    A   85%

    B   79%

    C   75%

    D   50%

4. The midpoint of $\overline{PQ}$ is R. R has coordinates $\left(^-3, 2, {}^-1\right)$ and P has coordinates $\left(4, {}^-6, {}^-6\right)$. What are the coordinates of Q?

    A $\left(^-10, 10, 4\right)$

    B $\left(^-3.5, 4, 2.5\right)$

    C $\left(0.5, {}^-2, {}^-3.5\right)$

    D $\left(11, {}^-14, {}^-11\right)$

5.   A cone has a radius of 12 cm and a height of 9 cm. What is the ***approximate*** lateral surface area of the cone? (To calculate the lateral surface area, A, use the formula $A = \pi r l$, where r is the radius and l is the slant height.)

A   89 cm^2

B   123 cm^2

C   424 cm^2

D   565 cm^2

6.   A garden has the shape of an isosceles right triangle. The length of the hypotenuse is 24 feet. What is the area of the garden?

A   576 ft^2

B   288 ft^2

C   203 ft^2

D   144 ft^2

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7.   In the diagram below, $j \perp m$ and $k \perp m$.
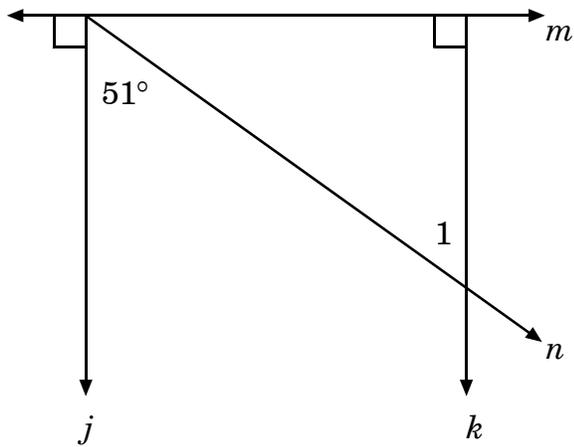
What is $m\angle 1$?

A   39

B   47

C   51

D   129

8.   Which pattern would fold to make a pyramid with a square base?

A

B


C

D
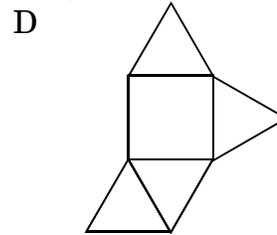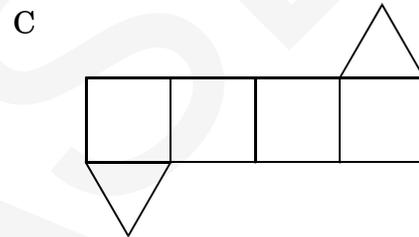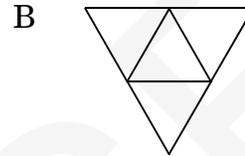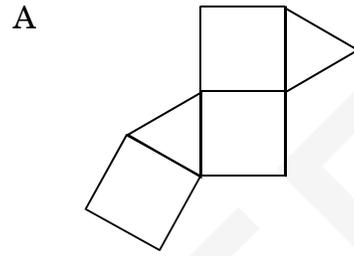
9.   In the figure below, $\overrightarrow{WY}$ bisects
      $\angle VWZ$, $m\angle VWY = 32$, and
      $m\angle VWX = 117$.
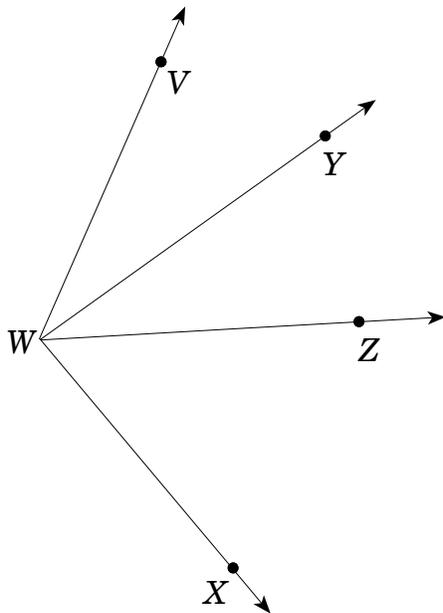
      What is $m\angle ZWX$?

      A   85

      B   53

      C   42.5

      D   26.5

10.   ▱WXYZ is a parallelogram.
      If $m\angle W = 40$, what is $m\angle Z$?

      A   40

      B   50

      C   140

      D   150

11.   In the diagram below, $\overline{PQ} \cong \overline{MQ}$ and
      $m\angle M = 70$.
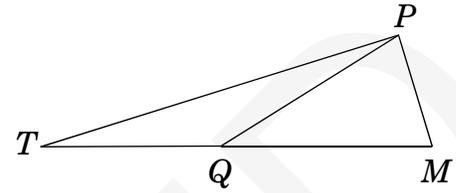
      What is $m\angle TQP$?

      A   70

      B   110

      C   140

      D   150

12.   What is the measure of an interior
      angle of a regular polygon with
      16 sides?

      A   22.5°

      B   25.7°

      C   157.5°

      D   205.7°

13. M is the midpoint of
       $\overline{RS}$, $RM = (3x + 1)$, and
       $MS = (4x - 2)$. What is RS?

       A   20

       B   17

       C   10

       D   3

14.   The slope of a line tangent to a circle
       is $\frac{2}{5}$. What is the slope of the line
       that passes through the point of
       tangency and the center of the circle?

       A $\frac{-5}{2}$

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

       C $\frac{2}{5}$

       D $\frac{5}{2}$

15.   Which statement is logically
       equivalent to the given statement?

       > If a quadrilateral is a rhombus,
       > then it is a parallelogram.

       A   If a quadrilateral is a
            parallelogram, then it is a
            rhombus.

       B   If a quadrilateral is not a
            rhombus, then it is not a
            parallelogram.

       C   If a quadrilateral is not a
            rhombus, then it is a
            parallelogram.

       D   If a quadrilateral is not a
            parallelogram, then it is not
            a rhombus.

16.   A regular tetrahedron is a triangular
       pyramid. What is the total surface
       area of a regular tetrahedron with
       base edges of 7 cm?

       A $7\sqrt{3}$ cm^2

       B $14\sqrt{3}$ cm^2

       C $28\sqrt{3}$ cm^2

       D $49\sqrt{3}$ cm^2

17. A translation is applied to $\triangle FGH$, forming $\triangle F'G'H'$. If the translation is described by $(x', y') = (x + 2, y - 3)$, which graph shows the translation correctly?

A

B

C

D
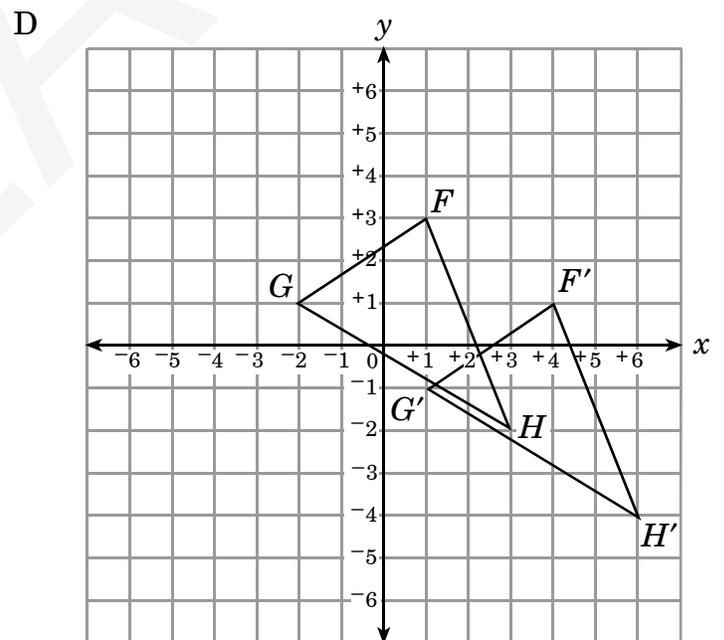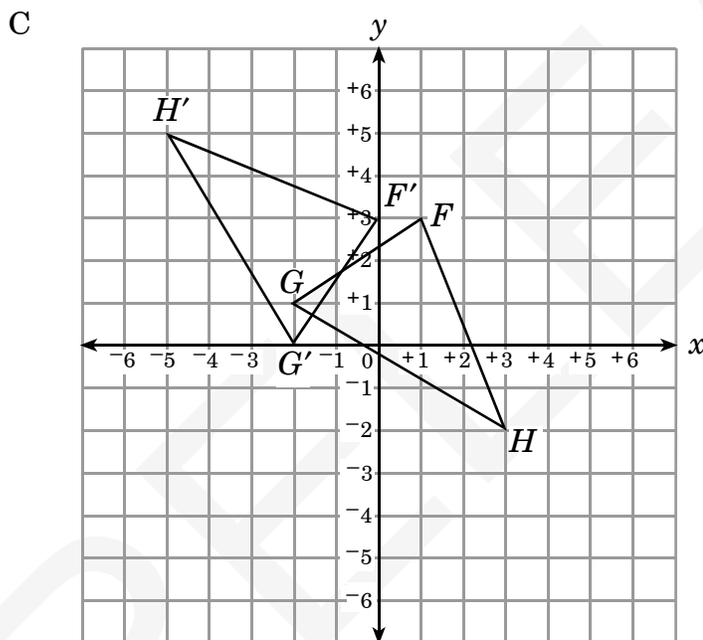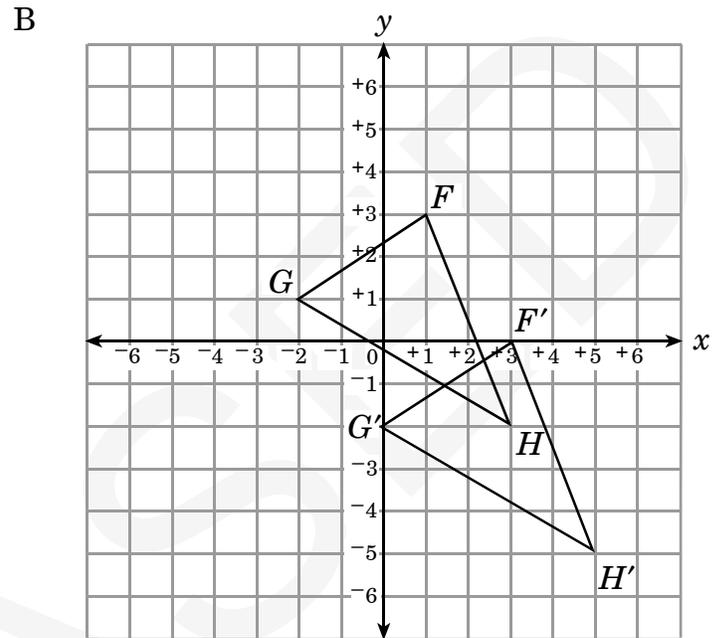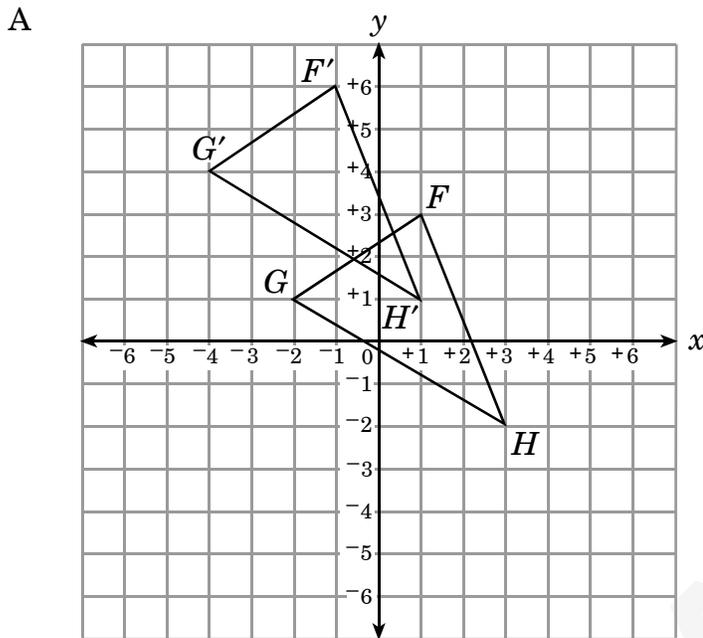
18.

The vertex matrix for $\triangle PQR$ is $\begin{bmatrix} -2 & 2 & 3 \\ -2 & 4 & -3 \end{bmatrix}$. The graph below shows $\triangle PQR$ and its

image, $\triangle P'Q'R'$, after a transformation.
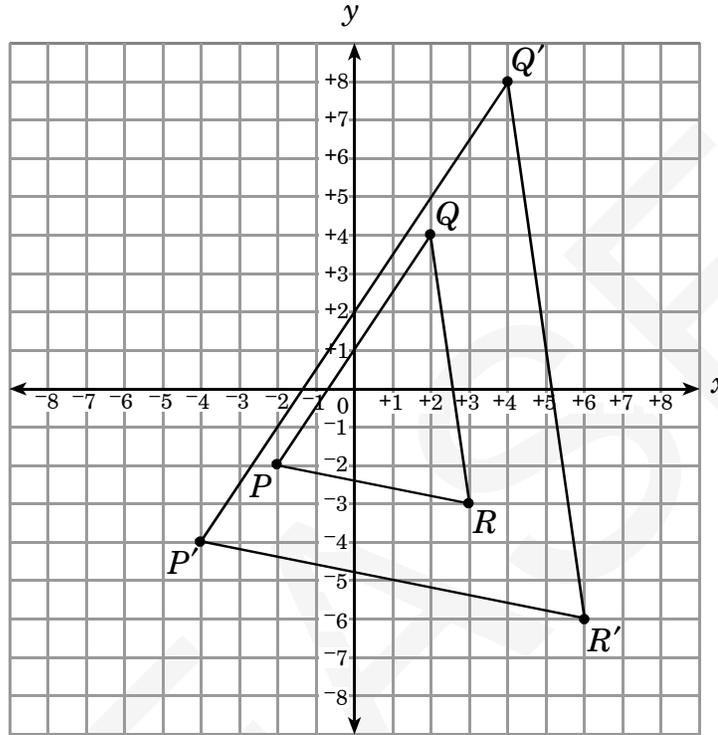
Which matrix expression produces the vertex matrix for $\triangle P'Q'R'$?

A $\quad \dfrac{1}{2}\begin{bmatrix} -2 & 2 & 3 \\ -2 & 4 & -3 \end{bmatrix}$

B $\quad 2\begin{bmatrix} -2 & 2 & 3 \\ -2 & 4 & -3 \end{bmatrix}$

C $\quad \dfrac{1}{2}\begin{bmatrix} -4 & 4 & 6 \\ -4 & 8 & -6 \end{bmatrix}$

D $\quad 2\begin{bmatrix} -4 & 4 & 6 \\ -4 & 8 & -6 \end{bmatrix}$

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19.   If $\triangle SLM$ is rotated 180° about the origin, what will be the coordinates for the image of M?

A $(5, 5)$

B $(5, ^-5)$

C $(^-5, 5)$

D $(^-5, ^-5)$

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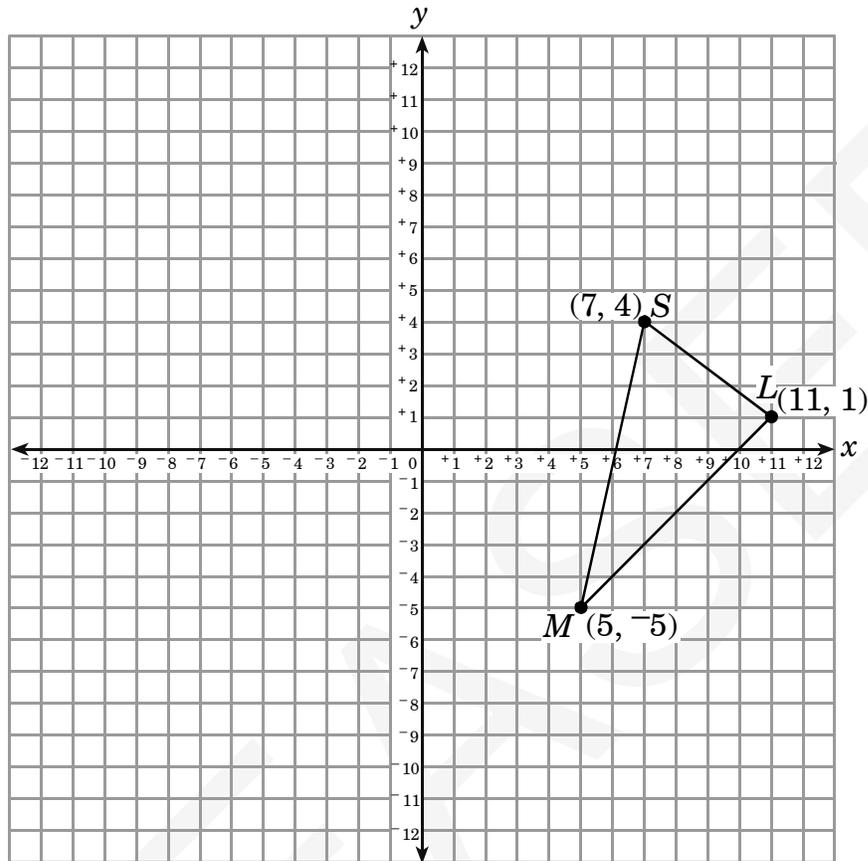
20.

The vertex matrix for $\triangle JKL$ is $\begin{bmatrix} {}^-2 & 2 & 4 \\ 1 & 5 & 3 \end{bmatrix}$. $\triangle JKL$ is translated 2 units right and

3 units up, resulting in $\triangle J'K'L'$. A translation of 4 units left and 1 unit up is applied to

$\triangle J'K'L'$, resulting in $\triangle J''K''L''$. Which matrix expression gives the vertex matrix for

$\triangle J''K''L''$?

A $\quad \begin{bmatrix} {}^-2 & 2 & 4 \\ 1 & 5 & 3 \end{bmatrix} + \begin{bmatrix} 2 & 2 & 2 \\ 3 & 3 & 3 \end{bmatrix}$

B $\quad \begin{bmatrix} {}^-2 & 2 & 4 \\ 1 & 5 & 3 \end{bmatrix} + \begin{bmatrix} {}^-4 & {}^-4 & {}^-4 \\ 1 & 1 & 1 \end{bmatrix}$

C $\quad \begin{bmatrix} {}^-2 & 2 & 4 \\ 1 & 5 & 3 \end{bmatrix} + \begin{bmatrix} 2 & 2 & 2 \\ 2 & 2 & 2 \end{bmatrix}$

D $\quad \begin{bmatrix} {}^-2 & 2 & 4 \\ 1 & 5 & 3 \end{bmatrix} + \begin{bmatrix} {}^-2 & {}^-2 & {}^-2 \\ 4 & 4 & 4 \end{bmatrix}$

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21.   In order to win a game, Sheila must spin a 7 on the spinner below.
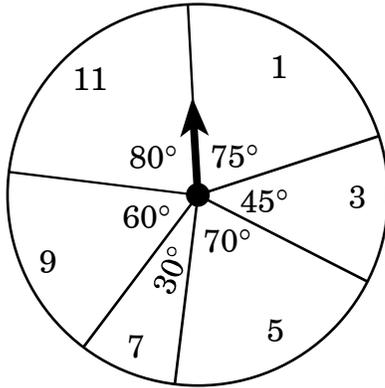

If the spinner is fair, what is the probability that she will spin a 7?

A $\frac{1}{12}$

B $\frac{1}{6}$

C $\frac{3}{10}$

D $\frac{5}{12}$

22.   Billy is 74 in. tall, and his shadow is 70 in. long. What is the *approximate* angle of elevation of the sun?

A   19°

B   43°

C   47°

D   71°

23.   The perimeter of a regular hexagon is 48 ft. What is the *approximate* area of this polygon?

A   288 ft^2

B   166 ft^2

C   96 ft^2

D   28 ft^2

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24. A plastic tray is shown below, with the dimensions labeled. The tray does not have a cover on top. The bottom and two of the sides are rectangles. The remaining two sides are congruent isosceles trapezoids.
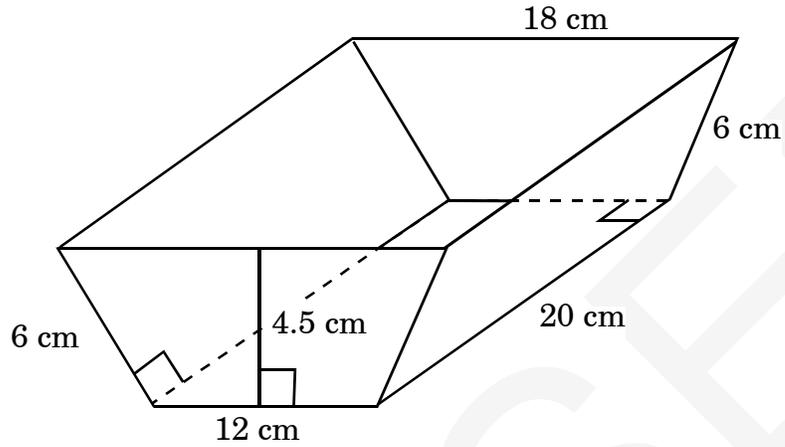

What is the total area of the outer surface of the tray?

A   495 cm^2

B   584 cm^2

C   615 cm^2

D   975 cm^2

25. A container in the shape of a rectangular prism has a base that measures 20 centimeters by 30 centimeters and has a height of 15 centimeters. The container is partially filled with water. A student adds more water to the container and notes that the water level rises 2.5 cm. What is the volume of the added water?

A   1,500 cm^3

B   3,600 cm^3

C   4,500 cm^3

D   9,000 cm^3

26. A truck is at the top of a ramp as shown below.
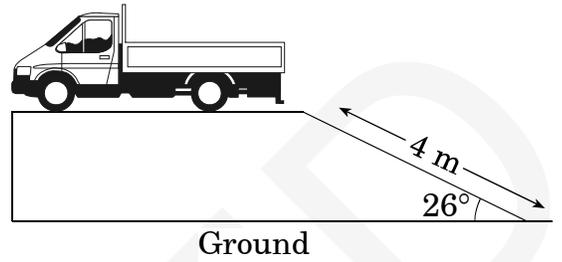
Ground

Approximately how high above the ground is the truck?

A   4.45 m

B   3.59 m

C   1.95 m

D   1.75 m

27. In the figure below, $\overrightarrow{SR} \parallel \overrightarrow{UV}$.
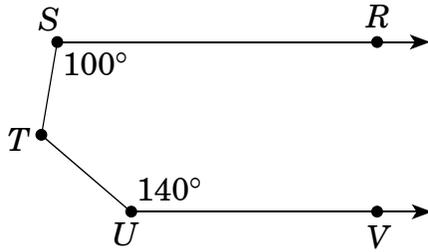
What is $m\angle STU$?

A   60

B   90

C   120

D   240

28. $\overrightarrow{OX}$ is the bisector of $\angle WOZ$ and $\overrightarrow{OY}$ is the bisector of $\angle XOZ$.
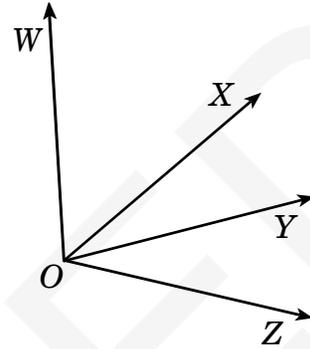
If $m\angle YOZ = 26.5$, what is $m\angle WOZ$?

A   53.0

B   79.5

C   106.0

D   132.5

29. Given parallelogram *EFGH*, what is the length of side $\overline{EF}$?

E

F

3x + 6

27

H

2x + 5

G
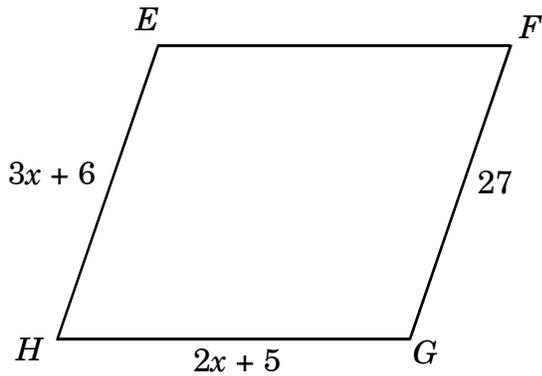
A   27

B   21

C   19

D   7

30. Given $\angle VYX$ is bisected by $\overrightarrow{YW}$, $m\angle VYX = (6r - 18)$, and $m\angle VYW = 36$. What is the value of *r*?

A   15

B   30

C   36

D   72

31. Kevin's teacher gave him the following pieces of cardboard.

2 equilateral triangles:

4 in.

4 squares:

4 in.
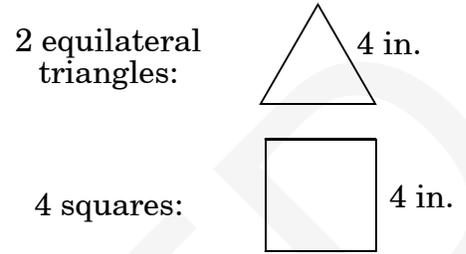
Which polyhedron can Kevin build using some or all of these pieces?

A   a triangular prism

B   a rectangular prism

C   a triangular pyramid

D   a square pyramid

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32.   Circles P, Q, and R are shown below. The diameter of circle R is 22.
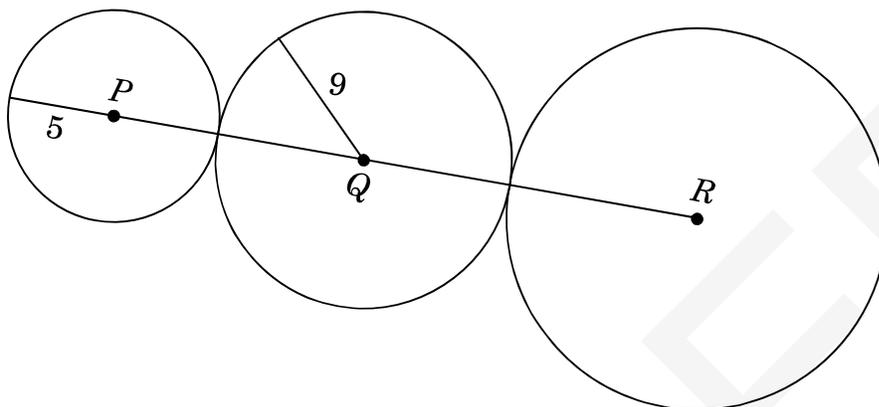
What is the length of $\overline{PR}$?

A   25

B   34

C   39

D   50

33.   Based on the coordinates $E(^-2, ^-3)$, $F(3, ^-3)$, $G(6, 1)$, $H(3, 5)$, $I(^-2, 5)$, and $J(1, 1)$, what **best** describes polygon $EFGHIJ$?

A   equilateral convex

B   equilateral concave

C   equiangular concave

D   equiangular convex

34.   What is the inverse of the statement in the box?

> If a polygon is regular, then it is convex.

A   If a polygon is not regular, then it is not convex.

B   If a polygon is convex, then it is regular.

C   If a polygon is not regular, then it is convex.

D   If a polygon is not convex, then it is not regular.

35. Which parts must be congruent to prove $\triangle PQR \cong \triangle PSR$ by SAS?

P

R

Q   S
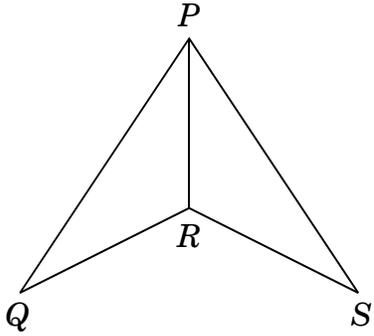
A $\angle Q \cong \angle S$ and $\overline{QP} \cong \overline{SP}$

B $\angle Q \cong \angle S$ and $\overline{QR} \cong \overline{SR}$

C $\angle QRP \cong \angle SRP$ and $\overline{QP} \cong \overline{SP}$

D $\angle QPR \cong \angle SPR$ and $\overline{QP} \cong \overline{SP}$

36. A plane intersects a sphere that has a radius of 13 cm. The distance from the center of the sphere to the closest point on the plane is 5 cm. What is the radius of the circle that is the intersection of the sphere and the plane?

A   8 cm

B   10 cm

C   12 cm

D   13 cm

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37. $\triangle PQR$, shown below, will be rotated clockwise 180° about the origin.
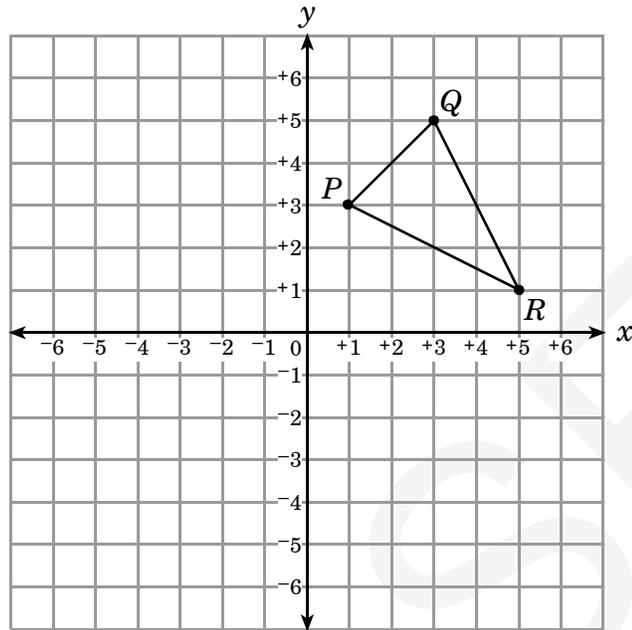
Which rule describes the transformation?

A $(x', y') = (x, y)$

B $(x', y') = (^-x, y)$

C $(x', y') = (x, ^-y)$

D $(x', y') = (^-x, ^-y)$

38. The vertex matrix for $\triangle RST$ is

$\begin{bmatrix} {}^-2 & 3 & 2 \\ {}^-3 & {}^-1 & {}^-4 \end{bmatrix}$. $\triangle R'S'T'$ is the image

produced by translating $\triangle RST$

3 units left and 4 units up. What is

the vertex matrix for $\triangle R'S'T'$?

A $\begin{bmatrix} {}^-5 & 0 & {}^-1 \\ {}^-7 & {}^-5 & {}^-8 \end{bmatrix}$

B $\begin{bmatrix} {}^-5 & 0 & {}^-1 \\ 1 & 3 & 0 \end{bmatrix}$

C $\begin{bmatrix} 1 & 6 & 5 \\ {}^-7 & {}^-5 & {}^-8 \end{bmatrix}$

D $\begin{bmatrix} 1 & 6 & 5 \\ 1 & 3 & 0 \end{bmatrix}$

39. Triangle PQR has vertices $P({}^-1, 3)$,
$Q(1, 2)$, and $R({}^-2, {}^-1)$. When $\triangle PQR$
is reflected over the line $y = {}^-2$, what
are the coordinates of P'?

A $({}^-1, {}^-3)$

B $({}^-1, {}^-7)$

C $({}^-2, {}^-2)$

D $({}^-3, {}^-3)$

40. The vertex matrix for $\triangle MNO$ is

$\begin{bmatrix} 5 & 0 & 8 \\ {}^-3 & 2 & {}^-4 \end{bmatrix}$. What is the vertex

matrix for $\triangle M'N'O'$, the image

produced by reflecting $\triangle MNO$

over the x-axis?

A $\begin{bmatrix} 5 & 0 & 8 \\ {}^-3 & 2 & {}^-4 \end{bmatrix}$

B $\begin{bmatrix} 5 & 0 & 8 \\ 3 & {}^-2 & 4 \end{bmatrix}$

C $\begin{bmatrix} {}^-5 & 0 & {}^-8 \\ 3 & {}^-2 & 4 \end{bmatrix}$

D $\begin{bmatrix} {}^-5 & 0 & {}^-8 \\ {}^-3 & 2 & {}^-4 \end{bmatrix}$

41.   A right triangle is shown below.
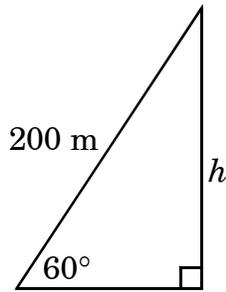
What is the **approximate** value of h?

A   100 meters

B   115 meters

C   140 meters

D   173 meters

42. $\overline{KM}$ is an altitude of $\triangle JKL$, and $\overline{KM} \cong \overline{JM}$. The measure of $\angle LKM$ is $55°$, and $ML = 12$ cm.
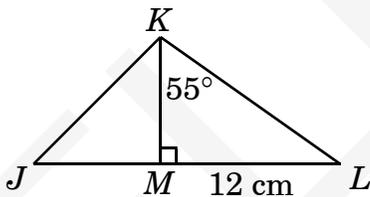
What is the **approximate** length of $\overline{JK}$?

A   8.4 cm

B   11.9 cm

C   20.7 cm

D   24.2 cm

43.   A number line is shown below.
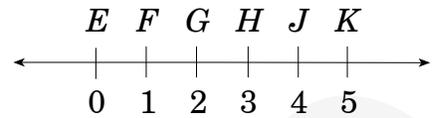
Point P will be picked at random on $\overline{EK}$. What is the probability that P will be on $\overline{FK}$?

A $\frac{4}{6}$

B $\frac{3}{4}$

C $\frac{4}{5}$

D $\frac{5}{6}$

44. Katie, a gardener, needs to put grass seeds on the triangle formed by the 3 roads below. Each side of the grass triangle is 350 ft long.
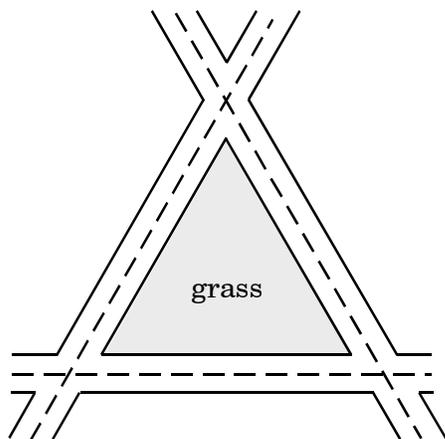
If one bag of seed covers 10,000 ft^2, how many bags will Katie need to buy?

A   5

B   6

C   7

D   8

45. What is the ***approximate*** surface area of a right hexagonal prism with a base perimeter of 96 meters and a height of 10 meters?
(Use $S = ap + ph$, where a is the apothem of the base, p is the perimeter of the base, and h is the height of the prism.)

A   3,620 m^2

B   2,290 m^2

C   1,728 m^2

D   1,625 m^2

46. The ratio of the height of the pyramid to the edge of the square base is 1.5 to 1. The height of the pyramid is 3 meters. What is the ***approximate*** length of the slant height of the pyramid?

A   4.4 m

B   3.2 m

C   2.8 m

D   1.4 m

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47. How long is $\overline{EF}$?
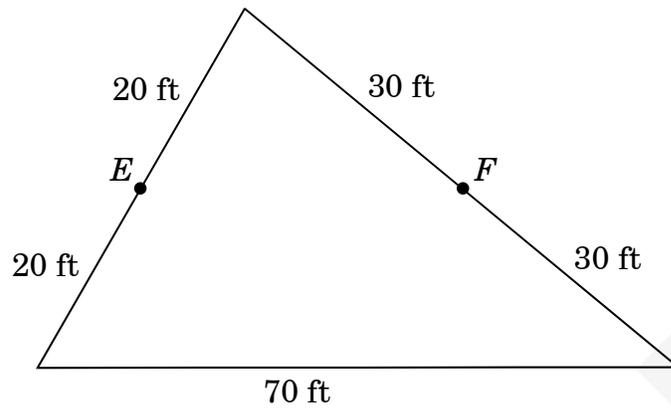
- A 20 ft

- B 25 ft

- C 30 ft

- D 35 ft

48.   According to the map, the road connecting the cities of Oakton (O) and Ridgeton (R) intersects the road connecting Maple View (M) and Pineville (P).
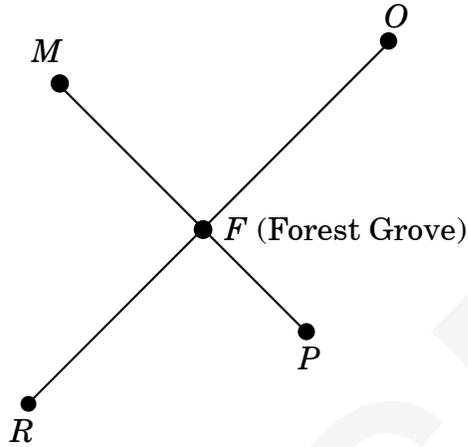
If the roads intersect in the town of Forest Grove (F) in the diagram, which statement is **always** true?

A $MP = RO$

B $\overline{PF} \perp \overline{OF}$

C $\angle OFP \cong \angle RFM$

D $\angle RFP \cong \angle MFR$

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49.   In circle O shown below, $\overline{RS} \cong \overline{ST}$.
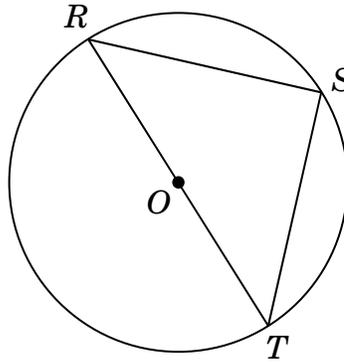
What kind of triangle is $\triangle RST$?

A   right

B   acute

C   obtuse

D   scalene

50.   Figure $JKLM$ is a parallelogram.
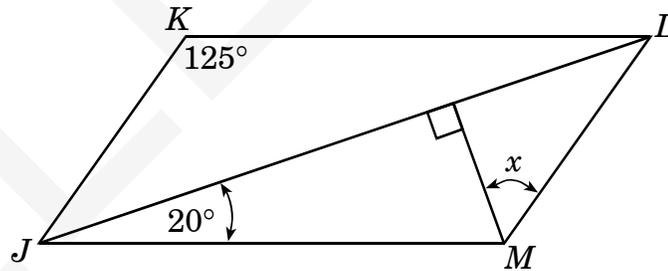
What is the value of x?

A   65°

B   55°

C   45°

D   35°

51. Given $\overline{LP}$, $LM = (3x + 1)$,
     $MN = (4x - 3)$, $NP = (6x - 5)$,
     and $\overline{LM} \cong \overline{NP}$.

     L   M   N   P
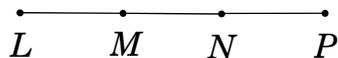
     What is the length of $\overline{MP}$?

     A   2

     B   7

     C   12

     D   19

52. What is the measure of an interior
     angle of a regular hexagon?

     A   45°

     B   60°

     C   120°

     D   135°

53. What is the **best** description of the
     solid figure shown below?

     4

     4   3

              5   3
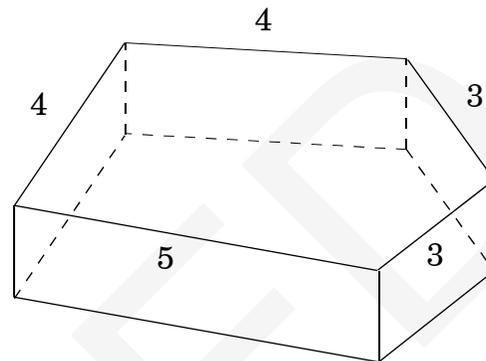
     A   a regular polygon

     B   a convex polygon

     C   a regular polyhedron

     D   a nonregular polyhedron

54. What is the converse of the statement
     in the box?

     If today is Saturday, then there
     is no school today.

     A   If there is no school today, then
          today is Saturday.

     B   If there is school today, then
          today is not Saturday.

     C   If today is not Saturday, then
          there is school today.

     D   If today is not Saturday, then
          there is no school today.

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55.   What are the coordinates of vertex K for the cube shown below?

A $\left(^-3, 3, 0\right)$

B $\left(^-3, 0, 3\right)$

C $\left(0, 3, ^-3\right)$

D $\left(3, ^-3, 0\right)$

NCDPI

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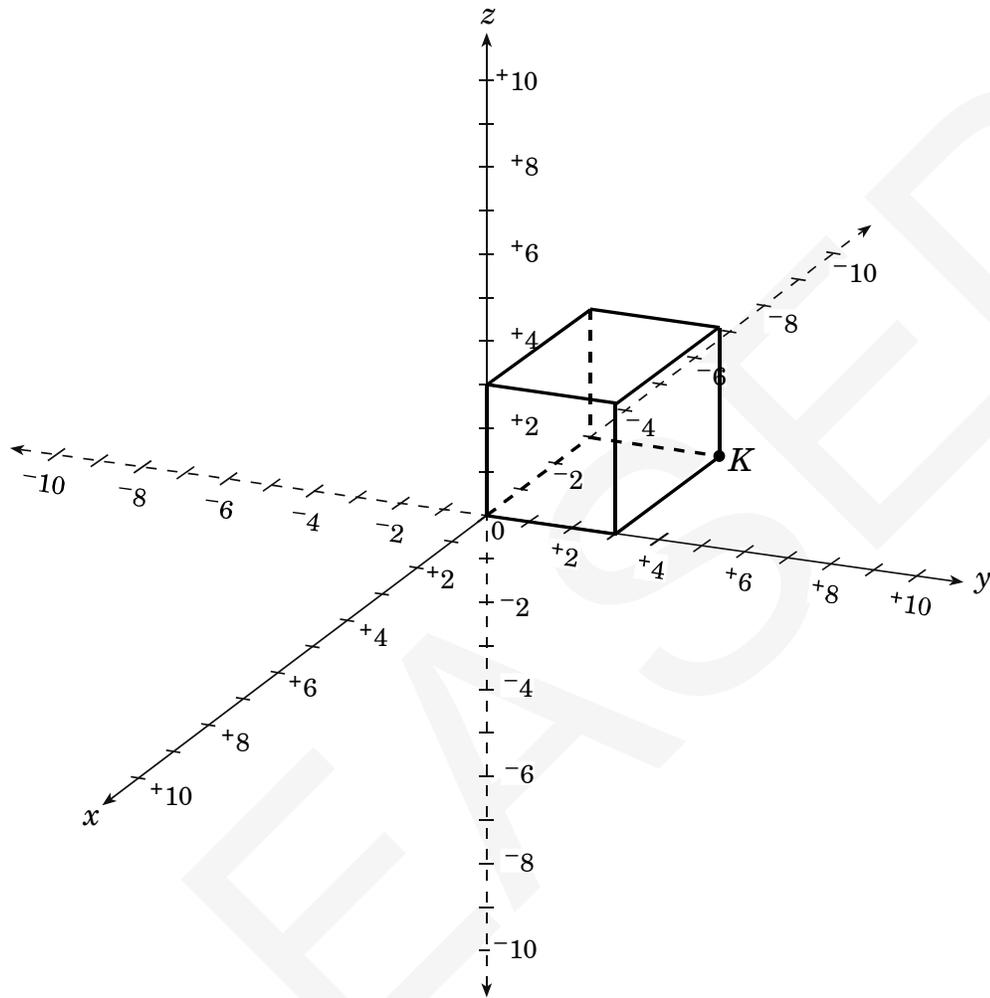
56. In the diagram below, $\overline{MN} \perp \overline{JL}$.
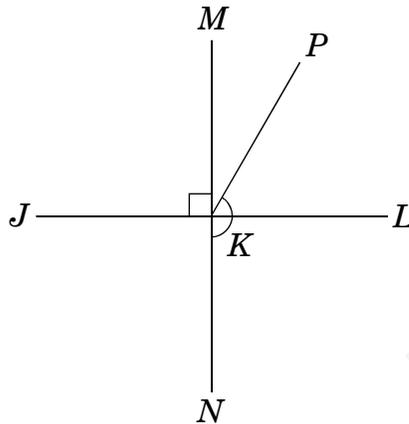
Which statement must be true?

A $m\angle PKN = m\angle JKP$

B $m\angle PKN = 90 + m\angle JKP$

C $m\angle PKN = 180 - m\angle JKP$

D $m\angle PKN = 270 - m\angle JKP$

NCDPI

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57.   In the diagram below, $\triangle R'S'T'$ is the image produced by applying a transformation to $\triangle RST$.
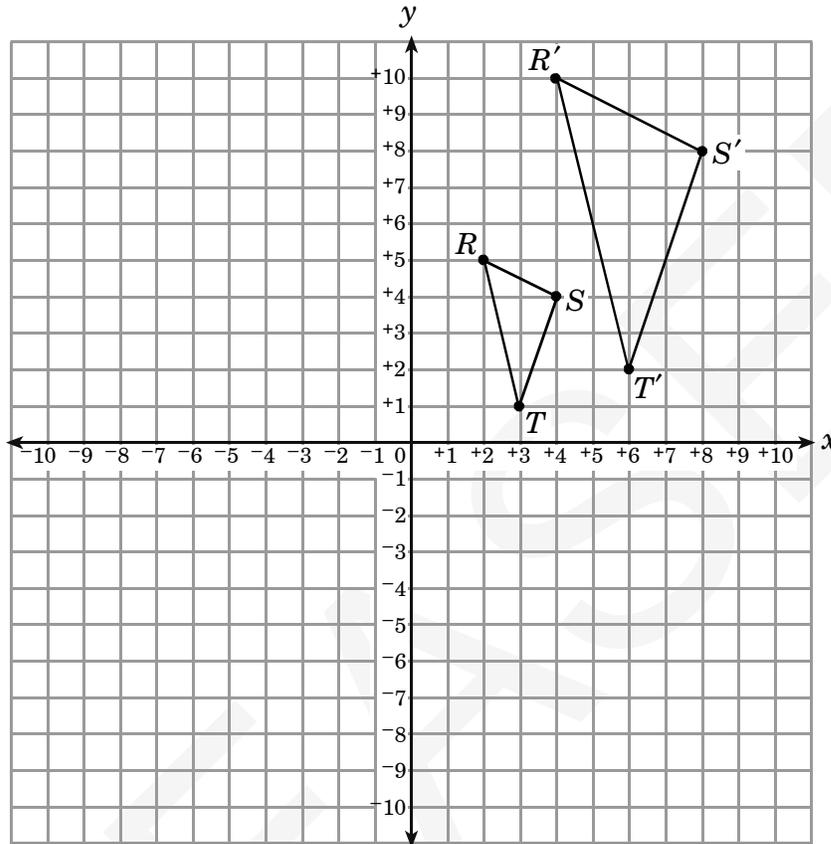
Which matrix calculation will give the vertex matrix for $\triangle R'S'T'$?

A $2\begin{bmatrix} 2 & 4 & 3 \\ 5 & 4 & 1 \end{bmatrix}$

B $\dfrac{1}{2}\begin{bmatrix} 4 & 8 & 6 \\ 10 & 8 & 2 \end{bmatrix}$

C $\begin{bmatrix} 2 & 2 & 2 \\ 2 & 2 & 2 \end{bmatrix} + \begin{bmatrix} 2 & 4 & 3 \\ 5 & 4 & 1 \end{bmatrix}$

D $\begin{bmatrix} \frac{1}{2} & \frac{1}{2} & \frac{1}{2} \\ \frac{1}{2} & \frac{1}{2} & \frac{1}{2} \end{bmatrix} + \begin{bmatrix} 4 & 8 & 6 \\ 10 & 8 & 2 \end{bmatrix}$

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58. $\triangle NOP$ has vertices $N(2, 3)$, $O(^-1, 4)$, and $P(3, ^-5)$. Which matrix calculation is used to determine the vertex matrix for the image $\triangle N'O'P'$ produced by a reflection across the y-axis?

A $\begin{bmatrix} ^-1 & 0 \\ 0 & 1 \end{bmatrix}\begin{bmatrix} 2 & ^-1 & 3 \\ 3 & 4 & ^-5 \end{bmatrix}$

B $\begin{bmatrix} 1 & 0 \\ 0 & ^-1 \end{bmatrix}\begin{bmatrix} 2 & ^-1 & 3 \\ 3 & 4 & ^-5 \end{bmatrix}$

C $\begin{bmatrix} ^-1 & 0 \\ 0 & ^-1 \end{bmatrix}\begin{bmatrix} 2 & ^-1 & 3 \\ 3 & 4 & ^-5 \end{bmatrix}$

D $\begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix}\begin{bmatrix} 2 & ^-1 & 3 \\ 3 & 4 & ^-5 \end{bmatrix}$

NCDPI

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59.   In the graph below, $\triangle P'Q'R'$ is the image produced by applying a transformation to $\triangle PQR$.

Which rule describes the transformation?

A $(x', y') = (x, y)$

B $(x', y') = (^-x, \,^-y)$

C $(x', y') = (^-x, y)$

D $(x', y') = (x, \,^-y)$

NCDPI

North Carolina Test of Geometry. Form H RELEASED Fall 2009
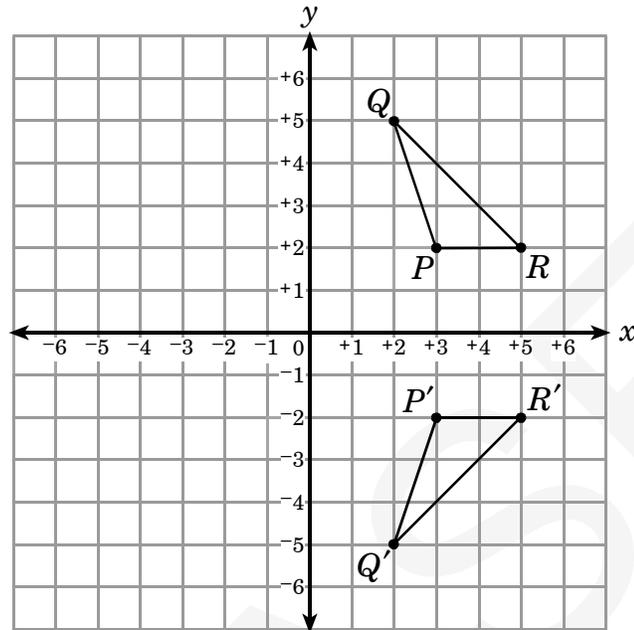
60.   Point P' is the image of point P after a counterclockwise rotation of $90°$ about the origin. If the coordinates of point P' are $\left(^-7, 3\right)$, what are the coordinates of point P?

A $\left(^-3,\ ^-7\right)$

B $\left(^-3, 7\right)$

C $\left(3,\ ^-7\right)$

D $\left(3, 7\right)$

STOP

End of Geometry Test

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Answer Key

Item Number	Correct Answer	Goal
1	C	1 — Number and Operations
2	D	1 — Number and Operations
3	B	1 — Number and Operations
4	A	1 — Number and Operations
5	D	1 — Number and Operations
6	D	1 — Number and Operations
7	C	2 — Geometry
8	D	2 — Geometry
9	B	2 — Geometry
10	C	2 — Geometry
11	C	2 — Geometry
12	C	2 — Geometry
13	A	2 — Geometry
14	A	2 — Geometry
15	D	2 — Geometry
16	D	2 — Geometry
17	B	3 — Algebra
18	B	3 — Algebra
19	C	3 — Algebra
20	D	3 — Algebra
21	A	1 — Number and Operations
22	C	1 — Number and Operations
23	B	1 — Number and Operations
24	C	1 — Number and Operations
25	A	1 — Number and Operations
26	D	1 — Number and Operations
27	C	2 — Geometry
28	C	2 — Geometry
29	C	2 — Geometry
30	A	2 — Geometry
31	A	2 — Geometry
32	B	2 — Geometry
33	B	2 — Geometry
34	A	2 — Geometry
35	D	2 — Geometry
36	C	2 — Geometry
37	D	3 — Algebra
38	B	3 — Algebra
39	B	3 — Algebra
40	B	3 — Algebra
41	D	1 — Number and Operations
42	B	1 — Number and Operations

43	C	1 — Number and Operations
44	B	1 — Number and Operations
45	B	1 — Number and Operations
46	B	1 — Number and Operations
47	D	2 — Geometry
48	C	2 — Geometry
49	A	2 — Geometry
50	B	2 — Geometry
51	C	2 — Geometry
52	C	2 — Geometry
53	D	2 — Geometry
54	A	2 — Geometry
55	A	2 — Geometry
56	D	2 — Geometry
57	A	3 — Algebra
58	A	3 — Algebra
59	D	3 — Algebra
60	D	3 — Algebra

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Raw to Scale Score Conversion

Raw Score	Scale Score
0	126
1	126
2	126
3	127
4	127
5	128
6	129
7	129
8	130
9	130
10	131
11	132
12	133
13	134
14	135
15	136
16	137
17	138
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28	148
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30	149
31	150
32	151
33	152
34	152
35	153
36	153
37	154
38	155
39	155
40	156
41	157

42	157
43	158
44	159
45	159
46	160
47	161
48	162
49	162
50	163
51	164
52	165
53	166
54	167
55	168
56	170
57	171
58	173
59	175
60	178