Question #1
Which type of transformation to the triangle has occurred from Graph 1 to Graph 2 in this diagram?

A) rotation
B) dilation
C) reflection
D) translation

Question #2
Which transformation could have been applied to \( \triangle WXY \) to obtain \( \triangle W'X'Y' \)?

A) reflection across the y-axis
B) reflection across the line \( y = -x \)
C) clockwise rotation of 90° about the origin
D) counterclockwise rotation of 90° about the origin

Question #3
Which transformations describe how \( \triangle ABC \) was moved to create \( \triangle A'B'C' \) in the picture below?

A) translation 5 units down and 1 unit to the right
B) translation 5 units down and 4 units to the left
C) reflection across the y-axis and translation 5 units down
D) reflection across the x-axis and clockwise rotation of 90 degrees

Question #4
In the grid above, \( A'B'C' \) is the resulting triangle after dilating triangle \( ABC \) about the origin. What scale factor was used in this dilation?

A) 1
B) 2
C) \( \frac{1}{2} \)
D) -2
**Question #5**

\( \triangle KON \) is dilated with a scale factor of 3 to form \( \triangle LOM \).

What are the coordinates of Point \( L \)?

A) (1, 0)  
B) (0, 0)  
C) (9, 0)  
D) (12, 0)

![Diagram of \( \triangle KON \) and \( \triangle LOM \)]

**Question #6**

What are the coordinates of \( B' \) if the origin is the center of dilation and the scale factor is \( \frac{1}{4} \)?

A) (1, 2)  
B) (1, 8)  
C) (4, 2)  
D) (8, 12)

![Diagram with point B' located at (8, 12)]

**Question #7**

In \( \triangle PQR \), \( \angle R = 90^\circ \). Which ratio represents the cosine of \( \angle Q \)?

A) \( \frac{PR}{QR} \)  
B) \( \frac{QR}{PR} \)  
C) \( \frac{PR}{PQ} \)  
D) \( \frac{QR}{PQ} \)

![Diagram of \( \triangle PQR \) with \( \angle Q \)]

**Question #8**

Right triangle \( \triangle ABC \) is shown below with the dimensions given in units.

What is the \( \sin(A) \) ?

A) \( \frac{3}{5} \)  
B) \( \frac{4}{5} \)  
C) \( \frac{3}{4} \)  
D) \( \frac{5}{3} \)

![Diagram of \( \triangle ABC \) with \( \sin(A) \) highlighted]
Question #9
Given Right Triangle PQR with Right Angle Q, which statement must be true?

A) \( \cos P = \cos R \)
B) \( \cos P = \sin R \)
C) \( \sin P = \sin Q \)
D) \( \cos P = \sin Q \)

Question #10
Triangle MNO is similar to Triangle PQR.

What is the length of PR?

A) 21
B) 50
C) 76
D) 116

Question #11
The triangles shown below are similar.

Which proportion can be used to find the length of RT?

A) \( \frac{7}{RT} = \frac{4}{10} \)
B) \( \frac{6}{RT} = \frac{7}{15} \)
C) \( \frac{4}{6} = \frac{RT}{10} \)
D) \( \frac{4}{7} = \frac{RT}{15} \)

Question #12
A man that is 6 feet (ft) tall casts a shadow that is 8 ft long. At the same time, a nearby building casts a shadow that is 160 ft long.

What is the height, in feet, of the building?

A) 112
B) 120
C) 152
D) 213
Question #13
West Auditorium has a rectangular screen with the dimensions shown.

East Auditorium has a similar screen that is 51.7 feet wide. What is the height of the screen in East Auditorium?
A) 21 feet
B) 22 feet
C) 23 feet
D) 30 feet

Question #14
A right triangle with the dimensions given in units is shown below.

What is the value of \( x \) in units?
A) 12
B) 12.5
C) 15
D) 20

Question #15
In the triangle, \( \angle PQR \) is a right angle.

Given that \( QT \perp PR \), which statement must be true?
A) \( \frac{PT}{TQ} = \frac{TQ}{TR} \)
B) \( \frac{PT}{TR} = \frac{TR}{TQ} \)
C) \( \frac{PQ}{TQ} = \frac{TR}{PQ} \)
D) \( \frac{PQ}{QR} = \frac{QR}{TR} \)

Question #16
A 6-foot tall man is standing 8 feet from the base of a lamppost, as shown in the diagram.

If the light from the lamppost casts a 4-foot shadow of the man, what is the height, in feet, of the lamppost?
A) 9
B) 12
C) 14
D) 18
**Question #17**

Triangles $RST$ and $PQW$ are shown below, where $\angle R \cong \angle W$ and $\angle T \cong \angle Q$.

What statement about the triangles is valid?

A) $\triangle RST \sim \triangle QPW$

B) $\triangle RTS \sim \triangle WPQ$

C) $\triangle RTS \sim \triangle WQP$

D) $\triangle TRS \sim \triangle QWP$

**Question #18**

In the figure below, the dimensions are given in units. $MP$ bisects $\angle LMN$.

Which proportion should be used to determine the value of $x$?

A) $\frac{9}{x} = \frac{15}{18-x}$

B) $\frac{x}{9} = \frac{15}{18-x}$

C) $\frac{15}{x} = \frac{9}{18-x}$

D) $\frac{x}{15} = \frac{9}{18-x}$

**Question #19**

The diagram below shows the location of a person standing near 2 bridges that cross a river.

What is $y$, the distance between the 2 bridges in meters?

A) 19.2

B) 22.5

C) 24

D) 30

**Question #20**

In the figure below, $PR$ bisects $\angle QPS$.

If $PQ = 8$ units, $SR = 7$ units, and $QR = 5$ units, which value is closest to $PS$ in units?

A) 14.4

B) 12.0

C) 11.2

D) 8.0
Question #21
Triangle $BAC$ is similar to Triangle $EDF$.

If $m \angle B = 41^\circ$ and $m \angle C = 59^\circ$, what is $m \angle D$?
A) $41^\circ$
B) $80^\circ$
C) $59^\circ$
D) $180^\circ$

Question #22
Trapezoid $ABCD$ is shown. The trapezoid is transformed by a dilation with a scale factor of 4 centered at the origin to produce $A'B'C'D'$. Which statement is a valid conclusion?

A) $AD$ is parallel to $A'D'$ because the product of the slopes of the two segments is -1.
B) $AD$ is perpendicular to $A'D'$ because the product of the slopes of the two segments is -1.
C) $AD$ is parallel to $A'D'$ because the slopes of the two segments are equal.
D) $AD$ is perpendicular to $A'D'$ because the slopes of the two segments are equal.

Question #23
A rectangle has dimensions 7 feet by 4 feet. Which of the following rectangles is similar to this rectangle but not congruent to it?
A) 21 feet by 8 feet
B) 7 feet by 4 feet
C) 14 feet by 8 feet
D) 35 feet by 12 feet
Question #24
You are putting new carpeting in a bedroom of your house. The area of the room is represented by the scale drawing below.

\[ \text{Scale: } 1 \text{ cm} = 3.5 \text{ feet} \]

\[ \frac{2 \text{ cm}}{1} \times \frac{3.5 \text{ ft}}{1} = 7 \text{ ft} \]

\[ 122.5 \times 61.25 = 183.75 \text{ ft}^2 \] \[ \text{total area} \]

If carpeting costs $7.10 per square foot, what is the total cost of the new carpeting for the bedroom?
A) $108.50
B) $183.75
C) $372.75
D) $1304.63

Question #25
Which of the following combinations for the sides of a triangle are NOT a Pythagorean Triple?
A) 1, 2, 3
B) 3, 4, 5
C) 10, 24, 26
D) 9, 12, 15

Question #26
Triangle JKL is rotated 90° clockwise and then translated 5 units left to form Triangle J'K'L'. Which transformation can be used to find the coordinates (x, y) of any point on Triangle J'K'L'?
A) \((x, y) \rightarrow (y - 5, -x)\)
B) \((x, y) \rightarrow (y + 5, -x)\)
C) \((x, y) \rightarrow (y, -x - 5)\)
D) \((x, y) \rightarrow (y, -x + 5)\)

Question #27
The lengths of the sides of a triangle are 8, 17, and 15 feet. Which statement is true about this triangle?
A) This is an acute triangle.
B) The area of this triangle is 120 ft².
C) The perimeter of the triangle is 23 feet.
D) This is a right triangle.
Question #28
On a coordinate plane, $\overline{CK}$ is translated down 2 units and left 5 units to create $\overline{C'K'}$. Line $r$ is drawn through $C$ and $C'$, and line $k$ is drawn through $K$ and $K'$. Which statement about lines $r$ and $k$ is true?
A) Lines $r$ and $k$ are perpendicular.
B) Lines $r$ and $k$ are parallel.
C) Lines $r$ and $k$ have the same $x$-intercept.
D) Lines $r$ and $k$ have the same $y$-intercept.

Question #29
Quadrilateral $WXYZ$ is translated to form quadrilateral $W'X'Y'Z'$. Which statement must be true?
A) $\overline{WX}$ and $\overline{W'X'}$ are parallel and congruent.
B) $\overline{WX}$ and $\overline{W'X'}$ are parallel but not congruent.
C) $\overline{WX}$ and $\overline{W'X'}$ are congruent but not parallel.
D) $\overline{WX}$ and $\overline{W'X'}$ are neither congruent nor parallel.

Question #30

Which of the following statements BEST describes the number of lines of symmetry and type of rotational symmetry for the figure above?
A) 2 lines of symmetry; $90^\circ$ rotational symmetry.
B) 4 lines of symmetry; $90^\circ$ rotational symmetry.
C) 2 lines of symmetry; $180^\circ$ rotational symmetry.
D) 4 lines of symmetry; $180^\circ$ rotational symmetry.

Question #31
A highway entrance ramp rises 4 feet above a horizontal road over a distance of 16 feet, as shown below.

Which equation can be used to determine the angle formed by the horizontal road and the entrance ramp?
A) $\tan x = \frac{4}{16}$
B) $\tan x = \frac{16}{4}$
C) $\sin x = \frac{4}{16}$
D) $\sin x = \frac{16}{4}$
Question #32
The current route used to travel by a vehicle between City A and City C through City B is shown on the coordinate grid below. A new road is under construction that will provide a direct route between City A and City C.

If each grid unit represents 3 kilometers, which is CLOSEST to the difference in distance between the new route and the old route from City A to City C?

A) 9.1 kilometers  
B) 12.1 kilometers  
C) 14.9 kilometers  
D) 19.1 kilometers

\[
\begin{align*}
\text{Old Route:} & \quad 17 \text{ units} \times 3 = 51 \text{ km} \\
\text{New Route:} & \quad 12.04 \text{ units} \times 3 = 36.12 \\
51 - 36.12 & \quad \approx 14.9 \text{ km}
\end{align*}
\]

Question #33
Jeff walked 54 meters along a river bank and saw a dock directly opposite him on the other side of the river. The river is 24 meters wide at the point where he saw the dock, as shown in the diagram below.

Which measurement is closest to the distance, in meters, of Jeff’s starting point from the dock?

A) 30.0  
B) 48.4  
C) 59.1  
D) 78.0

\[
\begin{align*}
54^2 + 24^2 &= c^2 \\
2916 + 576 &= c^2 \\
\sqrt{3492} &\approx 59.1
\end{align*}
\]

Question #34
A 12-foot-tall pole is tethered to the ground by a wire at point T.

Which expression could be used to determine \( \theta \), the measure of the angle that the wire makes with the ground?

A) \( \cos^{-1} \left( \frac{16.5}{12} \right) \)  
B) \( \sin^{-1} \left( \frac{12}{16.5} \right) \)  
C) \( \tan^{-1} \left( \frac{16.5}{12} \right) \)  
D) \( \tan^{-1} \left( \frac{12}{16.5} \right) \)
Question #35
Kelly placed logs along the perimeter of a vegetable garden in the shape of a 30°-60°-90° triangle, as shown. The longest side of the garden is 22 meters.

What is \( x \), the length in meters, of the longer leg of the triangle?
A) 11
B) \( \frac{22\sqrt{3}}{3} \)
C) 11\( \sqrt{2} \)
D) 11\( \sqrt{3} \)

\[ 2x = 22 \]
\[ x = \frac{22}{2} = 11 \]
\[ x = 11\sqrt{3} \]

Question #36
A diagonal of a square mirror is 10 inches long. What is the length, in inches, of each side of the mirror?
A) 5 inches
B) \( 5\sqrt{2} \) inches
C) 10 inches
D) \( 10\sqrt{2} \) inches

\[ \frac{\sqrt{2}w}{2} = 10 \]
\[ w = \frac{10\sqrt{2}}{\sqrt{2}} = 10 \]
\[ w = 10\sqrt{2} \]

Question #37
A radio antenna has a height of 27 feet. A support cable is attached to the top of the antenna making an angle of 30° as shown in the figure below.

Which measurement is closest to \( x \), length in feet, of the support cable?
A) 15.6
B) 31.2
C) 46.8
D) 54.0

\[ \frac{\sqrt{3}w}{2} = 27 \]
\[ w = \frac{27\sqrt{3}}{\sqrt{3}} = 9\sqrt{3} \]
\[ w = \frac{27\sqrt{3}}{2} \]
\[ x = 2w = 2(9\sqrt{3}) = 18\sqrt{3} \approx 31.2 \]

Question #38
Josh was skiing down a slope where the angle of elevation was 14°. If the length of the slope was 1500 feet, what was the vertical drop of the slope?

A) 374.0 feet
B) 362.9 feet
C) 1455.4 feet
D) 6200.3 feet

\[ x = 1500 \sin 14° \]
\[ x = 1500 \times 0.2412 \approx 361.8 \]
Question #39
Centerville is 30 miles due south of Loden, and Bryant is 72 miles due east of Centerville. What is the distance from Loden to Bryant in miles?
A) 51
B) 65
C) 78
D) 102

Question #40
Juan’s house has a rectangular doorway that is 8 feet high and 3 feet wide. Which measurement is closest to the length of the diagonal of the doorway?
A) 3.3
B) 7.4
C) 8.5
D) 11.0

Question #41
A circus elephant is being led up a 12-foot-long ramp to a trailer that is 4 feet above the ground.
Which equation could be used to find the angle between the ramp and the ground?
A) \( \sin \theta = \frac{4}{12} \)
B) \( \sin \theta = \frac{12}{4} \)
C) \( \tan \theta = \frac{4}{12} \)
D) \( \tan \theta = \frac{12}{4} \)

Question #42
A person stands 10 feet away from the base of a 300-foot office building.
Which equation could be used to find the angle of elevation?
A) \( \tan \theta = \frac{300}{10} \)
B) \( \tan \theta = \frac{10}{300} \)
C) \( \sin \theta = \frac{300}{10} \)
D) \( \sin \theta = \frac{10}{300} \)

Question #43
In the figure below, what is the \( \sin \theta \)?
A) \( \sqrt{5} \)
B) \( \frac{\sqrt{5}}{2} \)
C) \( \frac{\sqrt{5}}{5} \)
D) \( \frac{2\sqrt{5}}{5} \)