Part I

Answer all 24 questions in this part. Each correct answer will receive 2 credits. No partial credit will be allowed. Utilize the information provided for each question to determine your answer. Note that diagrams are not necessarily drawn to scale. For each statement or question, choose the word or expression that, of those given, best completes the statement or answers the question. Record your answers on your separate answer sheet. [48]

Use this space for computations.

1 After a dilation with center $(0,0)$, the image of $\overline{DB}$ is $\overline{D'B'}$. If $DB = 4.5$ and $D'B' = 18$, the scale factor of this dilation is
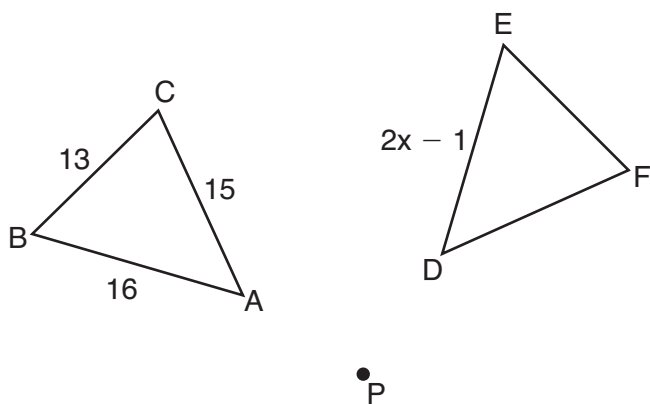
(1) $\dfrac{1}{5}$　　　　　　　　　(3) $\dfrac{1}{4}$

(2) 5　　　　　　　　　　　(4) 4

2 In the diagram below, $\triangle ABC$ with sides of 13, 15, and 16, is mapped onto $\triangle DEF$ after a clockwise rotation of 90° about point P.
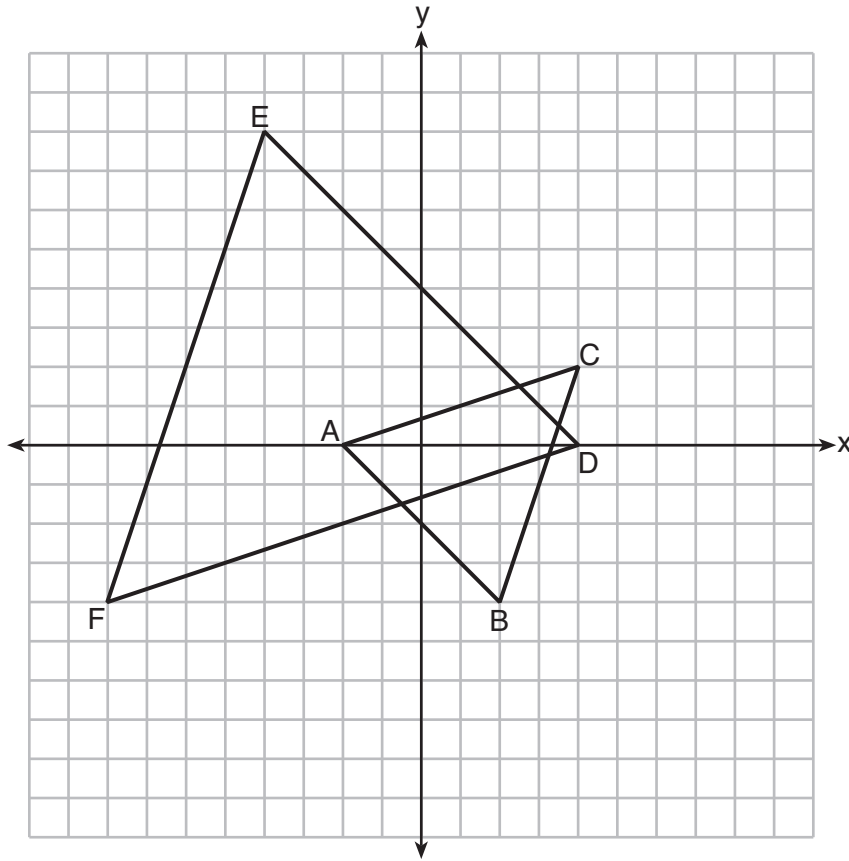

If $DE = 2x - 1$, what is the value of x?

(1) 7　　　　　　　　　　　(3) 8

(2) 7.5　　　　　　　　　　(4) 8.5

3 On the set of axes below, $\triangle ABC$ has vertices at $A(-2,0)$, $B(2,-4)$, $C(4,2)$, and $\triangle DEF$ has vertices at $D(4,0)$, $E(-4,8)$, $F(-8,-4)$.


Which sequence of transformations will map $\triangle ABC$ onto $\triangle DEF$?

(1) a dilation of $\triangle ABC$ by a scale factor of 2 centered at point A

(2) a dilation of $\triangle ABC$ by a scale factor of $\frac{1}{2}$ centered at point A

(3) a dilation of $\triangle ABC$ by a scale factor of 2 centered at the origin, followed by a rotation of 180° about the origin

(4) a dilation of $\triangle ABC$ by a scale factor of $\frac{1}{2}$ centered at the origin, followed by a rotation of 180° about the origin

4 The figure below shows a rhombus with noncongruent diagonals.
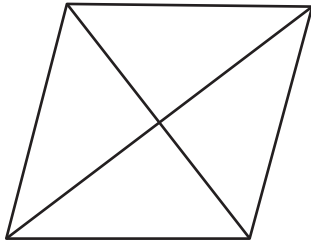
Which transformation would *not* carry this rhombus onto itself?

(1) a reflection over the shorter diagonal

(2) a reflection over the longer diagonal

(3) a clockwise rotation of 90° about the intersection of the diagonals

(4) a counterclockwise rotation of 180° about the intersection of the diagonals

5 In the diagram below of circle O, points K, A, T, I, and E are on the circle, $\triangle KAE$ and $\triangle ITE$ are drawn, $\overset{\frown}{KE} \cong \overset{\frown}{EI}$, and $\angle EKA \cong \angle EIT$.
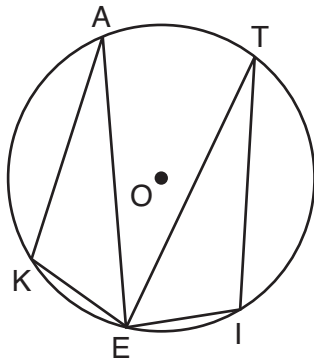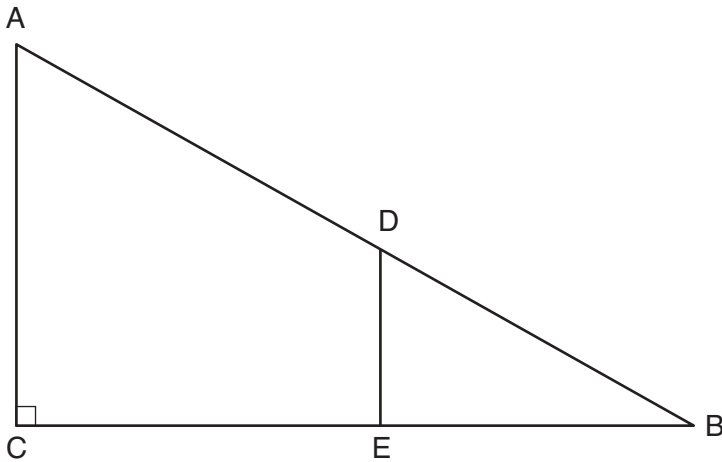

Which statement about $\triangle KAE$ and $\triangle ITE$ is always true?

(1) They are neither congruent nor similar.

(2) They are similar but not congruent.

(3) They are right triangles.

(4) They are congruent.

6 In right triangle ABC shown below, point D is on $\overline{AB}$ and point E is on $\overline{CB}$ such that $\overline{AC} \parallel \overline{DE}$.

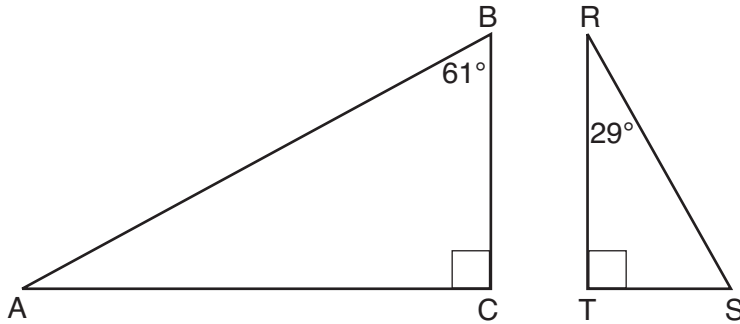If $AB = 15$, $BC = 12$, and $EC = 7$, what is the length of $\overline{BD}$?

(1) 8.75

(3) 5

(2) 6.25

(4) 4

7 In rhombus $VENU$, diagonals $\overline{VN}$ and $\overline{EU}$ intersect at S. If $VN = 12$ and $EU = 16$, what is the perimeter of the rhombus?
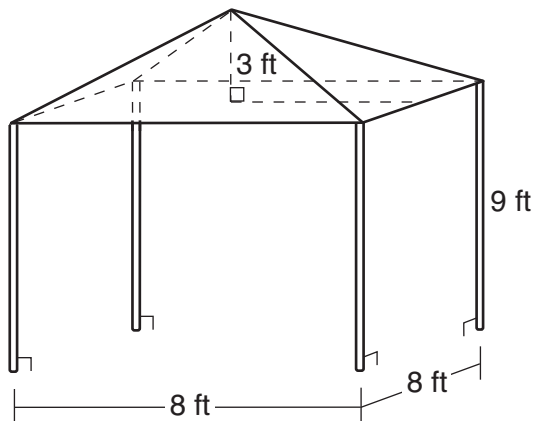
(1) 80

(3) 20

(2) 40

(4) 10

8 Given right triangle ABC with a right angle at C, m$\angle B$=61°. Given right triangle RST with a right angle at T, m$\angle R$ = 29°.

Which proportion in relation to $\triangle ABC$ and $\triangle RST$ is *not* correct?

(1) $\dfrac{AB}{RS} = \dfrac{RT}{AC}$

(3) $\dfrac{BC}{ST} = \dfrac{AC}{RT}$

(2) $\dfrac{BC}{ST} = \dfrac{AB}{RS}$

(4) $\dfrac{AB}{AC} = \dfrac{RS}{RT}$

9 A vendor is using an 8-ft by 8-ft tent for a craft fair. The legs of the tent are 9 ft tall and the top forms a square pyramid with a height of 3 ft.
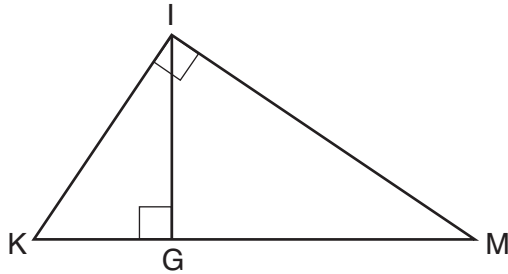

What is the volume, in cubic feet, of space the tent occupies?

(1) 256

(3) 672

(2) 640

(4) 768

10 In the diagram below of right triangle *KMI*, altitude $\overline{IG}$ is drawn to hypotenuse $\overline{KM}$.

If $KG = 9$ and $IG = 12$, the length of $\overline{IM}$ is

(1) 15   (3) 20

(2) 16   (4) 25

11 Which three-dimensional figure will result when a rectangle 6 inches long and 5 inches wide is continuously rotated about the longer side?

(1) a rectangular prism with a length of 6 inches, width of 6 inches, and height of 5 inches

(2) a rectangular prism with a length of 6 inches, width of 5 inches, and height of 5 inches

(3) a cylinder with a radius of 5 inches and a height of 6 inches

(4) a cylinder with a radius of 6 inches and a height of 5 inches

12 Which statement about parallelograms is always true?

(1) The diagonals are congruent.

(2) The diagonals bisect each other.

(3) The diagonals are perpendicular.

(4) The diagonals bisect their respective angles.

13 From a point on the ground one-half mile from the base of a historic monument, the angle of elevation to its top is 11.87°. To the *nearest foot*, what is the height of the monument?

(1) 543　　　　　　　　　　(3) 1086

(2) 555　　　　　　　　　　(4) 1110

14 The area of a sector of a circle with a radius measuring 15 cm is 75π cm². What is the measure of the central angle that forms the sector?
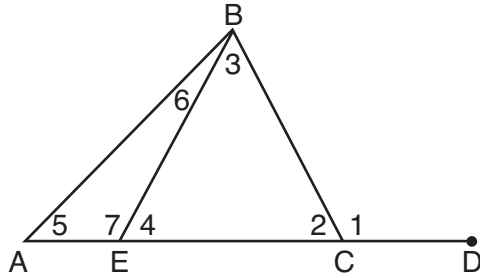
(1) 72°　　　　　　　　　　(3) 144°

(2) 120°　　　　　　　　　　(4) 180°

15 Point M divides $\overline{AB}$ so that $AM{:}MB = 1{:}2$. If A has coordinates $(-1,-3)$ and B has coordinates $(8,9)$, the coordinates of M are

(1) (2,1)　　　　　　　　　　(3) (5,5)

(2) $\left(\dfrac{5}{3},0\right)$　　　　　　　　(4) $\left(\dfrac{23}{3},8\right)$

16 In the diagram below of triangle ABC, $\overline{AC}$ is extended through point C to point D, and $\overline{BE}$ is drawn to $\overline{AC}$.

Which equation is always true?

(1) $m\angle 1 = m\angle 3 + m\angle 2$ (3) $m\angle 6 = m\angle 3 - m\angle 2$

(2) $m\angle 5 = m\angle 3 - m\angle 2$ (4) $m\angle 7 = m\angle 3 + m\angle 2$

17 In the diagram below of right triangle ABC, $AC = 8$, and $AB = 17$.
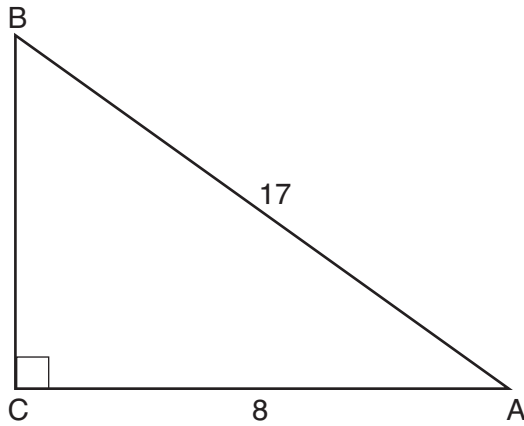
Which equation would determine the value of angle A?

(1) $\sin A = \dfrac{8}{17}$ (3) $\cos A = \dfrac{15}{17}$

(2) $\tan A = \dfrac{8}{15}$ (4) $\tan A = \dfrac{15}{8}$