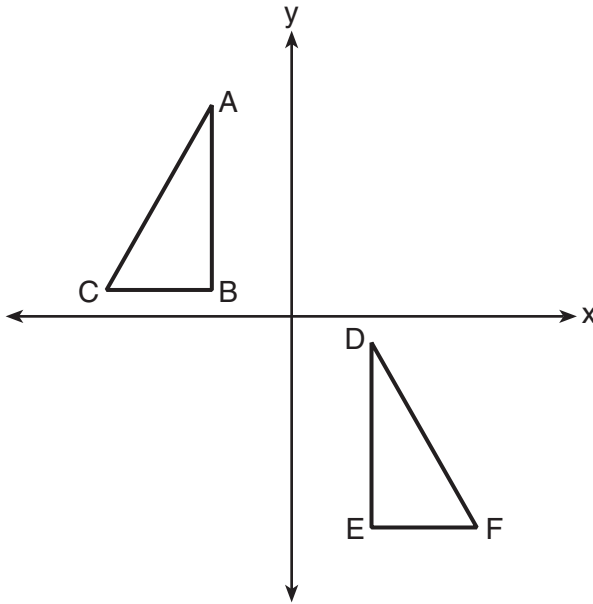


Part I

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 In the diagram below, $\triangle ABC \cong \triangle DEF$.

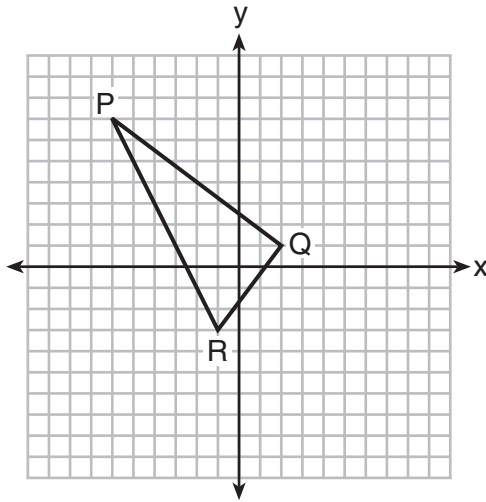


Which sequence of transformations maps $\triangle ABC$ onto $\triangle DEF$?

- (1) a reflection over the x -axis followed by a translation
- (2) a reflection over the y -axis followed by a translation
- (3) a rotation of 180° about the origin followed by a translation
- (4) a counterclockwise rotation of 90° about the origin followed by a translation

**Use this space for
computations.**

- 2** On the set of axes below, the vertices of $\triangle PQR$ have coordinates $P(-6,7)$, $Q(2,1)$, and $R(-1,-3)$.

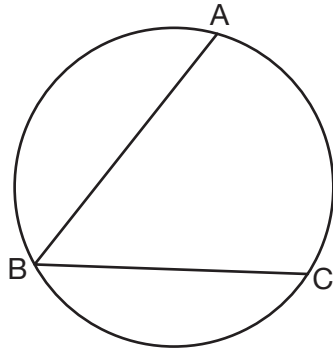


What is the area of $\triangle PQR$?

- (1) 10
(2) 20
(3) 25
(4) 50
- 3** In right triangle ABC , $m\angle C = 90^\circ$. If $\cos B = \frac{5}{13}$, which function also equals $\frac{5}{13}$?
- (1) $\tan A$
(2) $\tan B$
(3) $\sin A$
(4) $\sin B$

Use this space for computations.

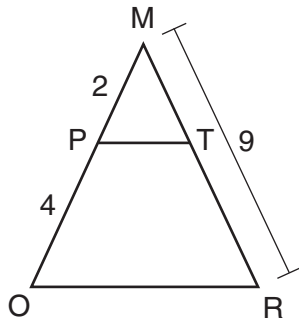
4 In the diagram below, $m\widehat{ABC} = 268^\circ$.



What is the number of degrees in the measure of $\angle ABC$?

- (1) 134°
- (2) 92°
- (3) 68°
- (4) 46°

5 Given $\triangle MRO$ shown below, with trapezoid $PTRO$, $MR = 9$, $MP = 2$, and $PO = 4$.



What is the length of \overline{TR} ?

- (1) 4.5
- (2) 5
- (3) 3
- (4) 6

**Use this space for
computations.**

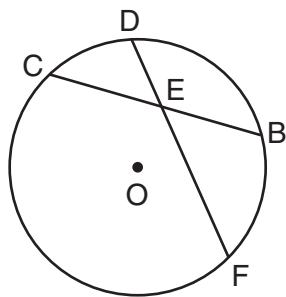
6 A line segment is dilated by a scale factor of 2 centered at a point not on the line segment. Which statement regarding the relationship between the given line segment and its image is true?

- (1) The line segments are perpendicular, and the image is one-half of the length of the given line segment.
- (2) The line segments are perpendicular, and the image is twice the length of the given line segment.
- (3) The line segments are parallel, and the image is twice the length of the given line segment.
- (4) The line segments are parallel, and the image is one-half of the length of the given line segment.

7 Which figure always has exactly four lines of reflection that map the figure onto itself?

- (1) square
- (2) rectangle
- (3) regular octagon
- (4) equilateral triangle

8 In the diagram below of circle O , chord \overline{DF} bisects chord \overline{BC} at E .

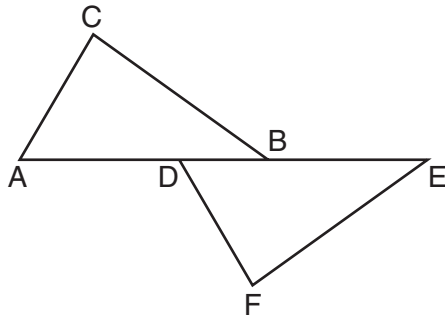


If $BC = 12$ and FE is 5 more than DE , then FE is

- (1) 13
- (2) 9
- (3) 6
- (4) 4

Use this space for computations.

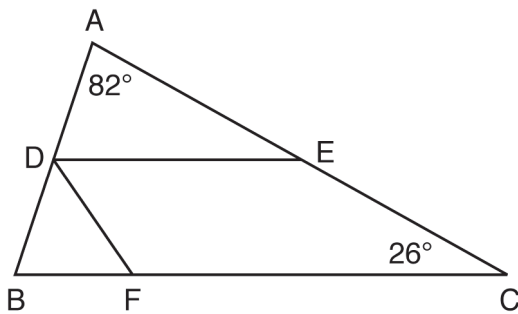
9 Kelly is completing a proof based on the figure below.



She was given that $\angle A \cong \angle EDF$, and has already proven $\overline{AB} \cong \overline{DE}$. Which pair of corresponding parts and triangle congruency method would *not* prove $\triangle ABC \cong \triangle DEF$?

- (1) $\overline{AC} \cong \overline{DF}$ and SAS (3) $\angle C \cong \angle F$ and AAS
(2) $\overline{BC} \cong \overline{EF}$ and SAS (4) $\angle CBA \cong \angle FED$ and ASA

10 In the diagram below, \overline{DE} divides \overline{AB} and \overline{AC} proportionally, $m\angle C = 26^\circ$, $m\angle A = 82^\circ$, and \overline{DF} bisects $\angle BDE$.



The measure of angle DFB is

- (1) 36° (3) 72°
(2) 54° (4) 82°

Use this space for
computations.

11 Which set of statements would describe a parallelogram that can always be classified as a rhombus?

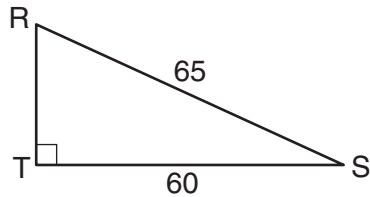
- I. Diagonals are perpendicular bisectors of each other.
- II. Diagonals bisect the angles from which they are drawn.
- III. Diagonals form four congruent isosceles right triangles.

- (1) I and II
- (2) I and III
- (3) II and III
- (4) I, II, and III

12 The equation of a circle is $x^2 + y^2 - 12y + 20 = 0$. What are the coordinates of the center and the length of the radius of the circle?

- (1) center (0,6) and radius 4
- (2) center (0,-6) and radius 4
- (3) center (0,6) and radius 16
- (4) center (0,-6) and radius 16

13 In the diagram of $\triangle RST$ below, $m\angle T = 90^\circ$, $RS = 65$, and $ST = 60$.



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

- (1) 23°
- (2) 43°
- (3) 47°
- (4) 67°

Use this space for computations.

14 Triangle $A'B'C'$ is the image of $\triangle ABC$ after a dilation followed by a translation.

Which statement(s) would always be true with respect to this sequence of transformations?

I. $\triangle ABC \cong \triangle A'B'C'$

II. $\triangle ABC \sim \triangle A'B'C'$

III. $\overline{AB} \parallel \overline{A'B'}$

IV. $AA' = BB'$

(1) II, only

(3) II and III

(2) I and II

(4) II, III, and IV

15 Line segment RW has endpoints $R(-4,5)$ and $W(6,20)$. Point P is on \overline{RW} such that $RP:PW$ is 2:3. What are the coordinates of point P ?

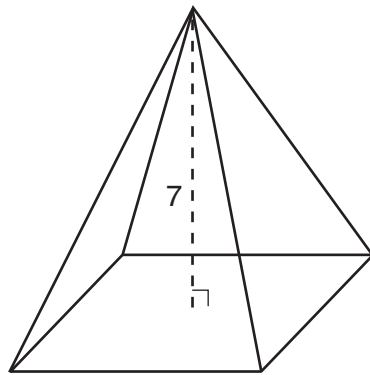
(1) (2,9)

(3) (2,14)

(2) (0,11)

(4) (10,2)

16 The pyramid shown below has a square base, a height of 7, and a volume of 84.



What is the length of the side of the base?

(1) 6

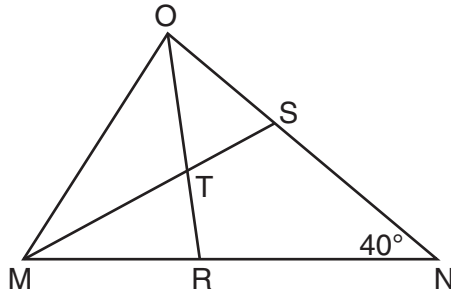
(3) 18

(2) 12

(4) 36

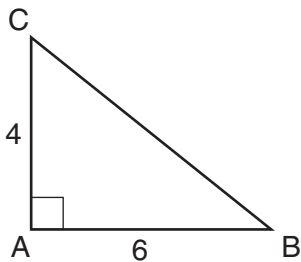
Use this space for
computations.

- 17 In the diagram below of triangle MNO , $\angle M$ and $\angle O$ are bisected by \overline{MS} and \overline{OR} , respectively. Segments MS and OR intersect at T , and $m\angle N = 40^\circ$.



If $m\angle TMR = 28^\circ$, the measure of angle OTS is

- (1) 40° (2) 50° (3) 60° (4) 70°
- 18 In the diagram below, right triangle ABC has legs whose lengths are 4 and 6.



What is the volume of the three-dimensional object formed by continuously rotating the right triangle around \overline{AB} ?

- (1) 32π (2) 48π (3) 96π (4) 144π

Use this space for
computations.

19 What is an equation of a line that is perpendicular to the line whose equation is $2y = 3x - 10$ and passes through $(-6,1)$?

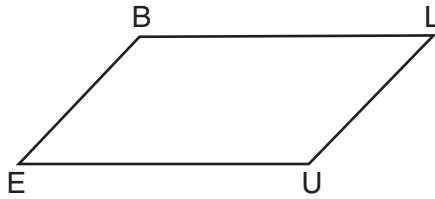
(1) $y = -\frac{2}{3}x - 5$

(3) $y = \frac{2}{3}x + 1$

(2) $y = -\frac{2}{3}x - 3$

(4) $y = \frac{2}{3}x + 10$

20 In quadrilateral $BLUE$ shown below, $\overline{BE} \cong \overline{UL}$.



Which information would be sufficient to prove quadrilateral $BLUE$ is a parallelogram?

(1) $\overline{BL} \parallel \overline{EU}$

(3) $\overline{BE} \cong \overline{BL}$

(2) $\overline{LU} \parallel \overline{BE}$

(4) $\overline{LU} \cong \overline{EU}$

21 A ladder 20 feet long leans against a building, forming an angle of 71° with the level ground. To the *nearest foot*, how high up the wall of the building does the ladder touch the building?

(1) 15

(3) 18

(2) 16

(4) 19

22 In the two distinct acute triangles ABC and DEF , $\angle B \cong \angle E$. Triangles ABC and DEF are congruent when there is a sequence of rigid motions that maps

(1) $\angle A$ onto $\angle D$, and $\angle C$ onto $\angle F$

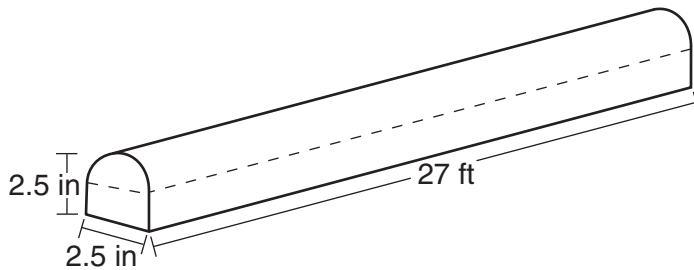
(2) \overline{AC} onto \overline{DF} , and \overline{BC} onto \overline{EF}

(3) $\angle C$ onto $\angle F$, and \overline{BC} onto \overline{EF}

(4) point A onto point D , and \overline{AB} onto \overline{DE}

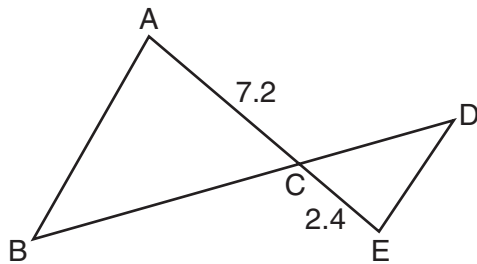
Use this space for computations.

- 23 A fabricator is hired to make a 27-foot-long solid metal railing for the stairs at the local library. The railing is modeled by the diagram below. The railing is 2.5 inches high and 2.5 inches wide and is comprised of a rectangular prism and a half-cylinder.



How much metal, to the *nearest cubic inch*, will the railing contain?

- (1) 151 (3) 1808
(2) 795 (4) 2025
- 24 In the diagram below, $AC = 7.2$ and $CE = 2.4$.



Which statement is *not* sufficient to prove $\triangle ABC \sim \triangle EDC$?

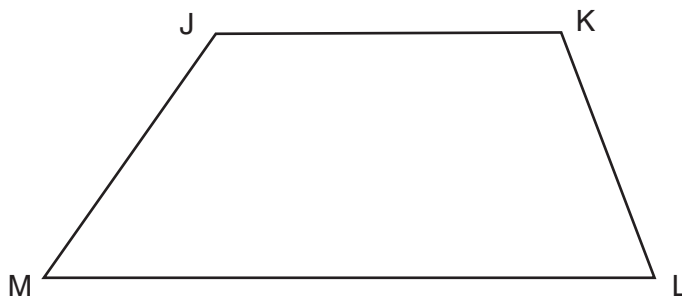
- (1) $\overline{AB} \parallel \overline{ED}$
(2) $DE = 2.7$ and $AB = 8.1$
(3) $CD = 3.6$ and $BC = 10.8$
(4) $DE = 3.0$, $AB = 9.0$, $CD = 2.9$, and $BC = 8.7$
-

Part II

Answer all 7 questions in this part. Each correct answer will receive 2 credits. Clearly indicate the necessary steps, including appropriate formula substitutions, diagrams, graphs, charts, etc. Utilize the information provided for each question to determine your answer. Note that diagrams are not necessarily drawn to scale. For all questions in this part, a correct numerical answer with no work shown will receive only 1 credit. All answers should be written in pen, except for graphs and drawings, which should be done in pencil. [14]

25 Given: Trapezoid $JKLM$ with $\overline{JK} \parallel \overline{ML}$

Using a compass and straightedge, construct the altitude from vertex J to \overline{ML} .
[Leave all construction marks.]



26 Determine and state, in terms of π , the area of a sector that intercepts a 40° arc of a circle with a radius of 4.5.