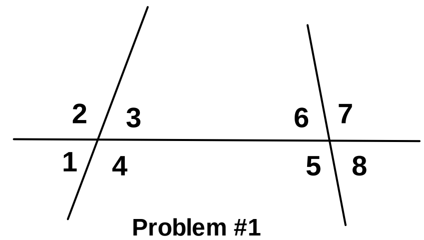
2008 ACTM State Geometry Exam

In each of the following choose the best answer and bubble the corresponding letter on the answer sheet provided. Be sure to work all 25 questions before working the tie-breaker problems. **Be aware that the figures are not always drawn to scale.**

1. In the figure $\angle 3 \cong \angle 6$. A pair of supplementary angles is



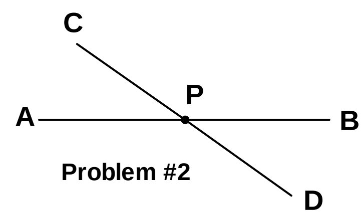
Problem #1

A. $\angle 2, \angle 4$ B. $\angle 4, \angle 5$

C. $\angle 1, \angle 6$ D. $\angle 1, \angle 7$

E. None of these

2. Let P be the midpoint of $\overline{AB}$ and $\overline{CD}$. Which of the following statements is true?



Problem #2

R. $\overline{AC} \parallel \overline{BD}$

S. $\overline{AD} \cong \overline{BC}$

T. AP + PD = BP + PC

A. R and S B. R and T C. S and T

D. R, S, and T E. None of These

3. The complement of an angle is $\frac{7}{25}$ of the supplement of the angle. What is the measure of the complement of the angle?

A. 35^o B. 145^o C. 55^o D. 125^o

E. None of these

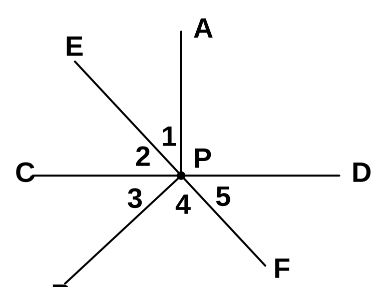
4. In an isosceles trapezoid the diagonals

A. bisect each other B. are perpendicular

C. are congruent D. intersect at a 45^o angle

E. None of these

5. In the figure $\overrightarrow{PA} \perp \overleftrightarrow{CD}$ and $\overrightarrow{PB} \perp \overleftrightarrow{EF}$. A pair of congruent angles is



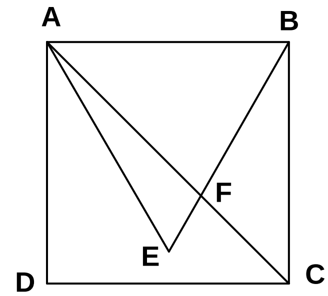
Problem #5

A. $\angle 1, \angle 3$ B. $\angle 2, \angle 3$

C. $\angle 1, \angle 5$ D. $\angle 3, \angle 5$

E. None of these

6. If ABCD is a square and ΔABE is an equilateral triangle, then the measure of $\angle BFC$ is



Problem #6

A. 75^o B. 90^o C. 105^o

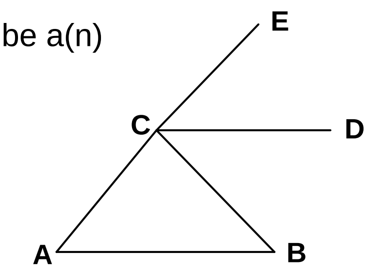
D. 100^o E. None of these

7. The sum of the measures of the interior angles of a polygon is 2160^o. The number of diagonals in the polygon is

A. 14 B. 77 C. 154

D. 84 E. None of these

8. In the figure, $\overline{CD} \parallel \overline{AB}$ and $\overrightarrow{CD}$ bisects $\angle BCE$. ΔABC must be a(n)



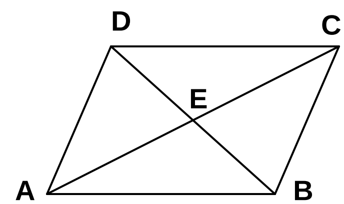
Problem #8

A. equilateral triangle B. obtuse triangle

C. isosceles triangle D. scalene triangle

E. None of these

9. ABCD is a parallelogram. If m $\angle BAD = 80^o$ which of the following must be true?



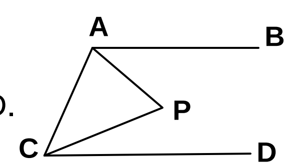
Problem #9

P m $\angle AED = 90^o$
Q. $\overline{DE} \cong \overline{AE}$
R. m $\angle ADE = 50^o$

A. P and Q B. P and R C. Q and R

D. R E. None of these

10. In the figure $\overrightarrow{AB} \parallel \overrightarrow{CD}$, $\overrightarrow{AP}$ bisects $\angle BAC$ and $\overrightarrow{CP}$ bisects $\angle ACD$. Then $\angle APC$ is a(n)

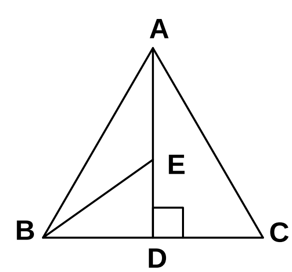


Problem #10

A. right angle B. acute angle C. obtuse angle

D. not enough information E. None of these

11. ΔABC is an equilateral triangle with AB = 30. If $\overline{AD}$ is an altitude and DE = $\frac{1}{3}\text{AD}$, then the measure of $\angle ABE$ is

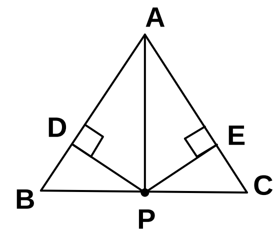


Problem #11

A. 36^o B. 45^o C. 120^o

D. 30^o E. None of these

12. ΔABC is an isosceles triangle with AB = AC. P is the midpoint of $\overline{BC}$, $\overline{PD} \perp \overline{AB}$ and $\overline{PE} \perp \overline{AC}$. Which of the following triangle congruences would be used to prove $\Delta BDP \cong \Delta CEP$?

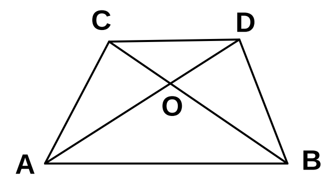


Problem #12

A. SAS B. SSA C. SSS

D. AAS E. None of these

13. In the figure, $\overline{CD} \parallel \overline{AB}$. To prove OB(OD) = OA(OC) one could prove



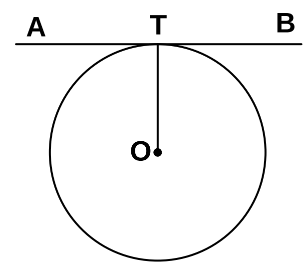
Problem #13

A. $\Delta AOC \sim \Delta BOD$ B. $\Delta AOB \sim \Delta DOC$

C. $\Delta ACD \sim \Delta DBA$ D. $\Delta COD \sim \Delta BOD$

E. None of these

14. $\overleftrightarrow{AB}$ is tangent to the circle at T. If O is the center of the circle, which of the following is/are true?



Problem #14

A. $\overrightarrow{OT}$ bisects $\angle AOB$

B. $\overleftrightarrow{OT}$ is the perpendicular bisector of $\overline{AB}$

C. $\overline{OA} \perp \overline{OB}$ D. $\overline{OA} \cong \overline{OB}$

E. None of these

15. A ladder leaning against a wall has a slope of $\frac{3}{4}$. If the top of the ladder is 10 feet above the base of the wall, then how long is the ladder?

A. 16 feet 8 inches B. 12 feel 4 inches C. 13 feet 4 inches

D. 15 feet 6 inches E. None of these

16. Let A = (–2, 1) and B = (4, 3) be points in the coordinate plane. The equation of the circle that has $\overline{AB}$ for a diameter is

A. $(x - 1)^2 + (y - 2)^2 = 40$ B. $(x - 1)^2 + (y - 2)^2 = 10$

C. $(x - 1)^2 + (y - 2)^2 = 25$ D. $(x - 1)^2 + (y - 2)^2 = 5$

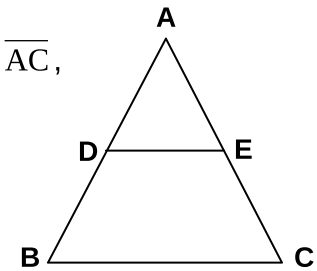
E. None of these

17. A line that is perpendicular to the line 3x – 2y = 6 and passes through (1,0) has the equation

A. $y = \frac{2}{3}(x-1)$ B. $y = -\frac{2}{3}(x-1)$ C. $y = -\frac{3}{2}(x-1)$

D. $y = \frac{3}{2}(x-1)$ E. None of these

18. ΔABC is an isosceles trigangle with D and E midpoints of $\overline{AB}$ and $\overline{AC}$, respectively. If AB = 12 and the perimeter of trapezoid BCED is 36 then BC =



Problem #18

A. 8 B. 16 C. 18

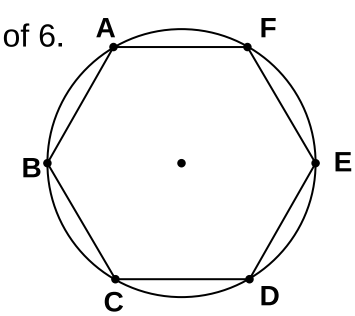
D. 9 E. None of these

19. A regular dodecagon (12 sides) is inscribed in a circle whose diameter is 20 inches. What is the length (to the nearest hundredth of an inch) of a side of the dodecagon?

A. 6.50 inches B. 13.00 inches C. 2.59 inches

D. 5.18 inches E. None of these

20. ABCDEF is a regular hexagon inscribed in a circle with a radius of 6. What is the perimeter of the rectangle BCEF?



Problem #20

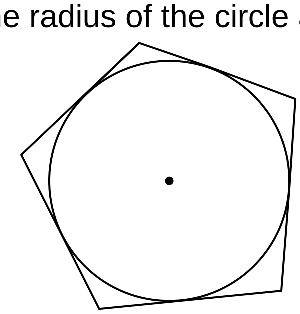
A. $12(1 + \sqrt{3})$ B. $36\sqrt{3}$

C. $12(1 + \sqrt{5})$ D, 24

E. None of these

21 A polygon is circumscribed about a circle. Which of the following is always true?

P The bisectors of the angles of the polygon intersect at he center of the circle.
Q The perpendicular bisectors of the sides intersect at the center of the circle.
R The area of the polygon is one-half the product of the radius of the circle and the perimeter of the polygon.


Problem #21

A. P and Q B. P and R

C. Q and R D. P, Q, and R

E. None of these

22. Let A = (5, – 2) and B = (8, y). If AB = $\sqrt{58}$ and y $\geq$ 5, then y =

A. 10 B. 6 C. 5 C. –9

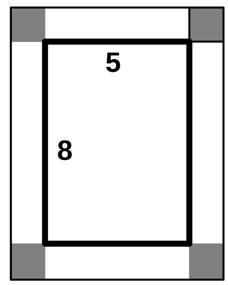
E. None of these

23. From a rectangular sheet of paper, Thomas makes an open rectangular prism by cutting squares from each corner and folding up the sides. If the base of the prism is 5 inches by 8 inches and it has a volume of 80 cubic inches, what is the area of the original sheet of paper?

A. 90 sq in B. 92 sq in

C. 108 sq in D. 56 sq in

E. None of these



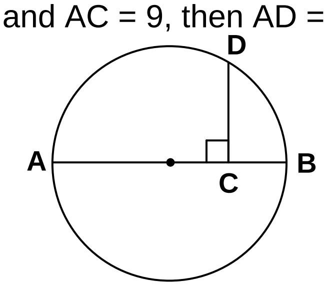
Problem #23

24. In the circle $\overline{AB}$ is a diameter and $\overline{CD} \perp \overline{AB}$. If AB = 13 and AC = 9, then AD =

A. Not enough information B. 10

C. 12 D. $\sqrt{117}$

E. None of these



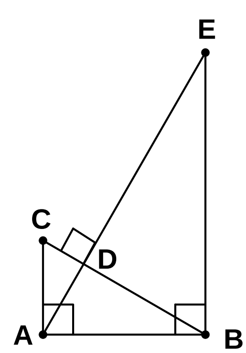
Problem #24

25. In the figure at the right m∠ABD = 30°, m∠BAE = 60° and the perpendiculars are as indicated. The ratio of the perimeter of ΔABC to the perimeter of ΔBDE is

A. 1 : 2 B. $\sqrt{3}$: 3

C. 1 : 3 D. 1 : 6

E. None of these



Problem #25

Be sure you have completed the 25 questions on the exam before you attempt the tie-breaker problems.

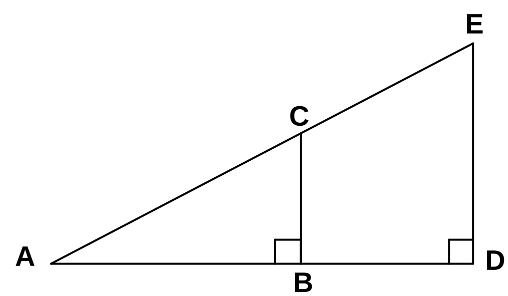
Tie Breaker Questions

Name ________________________________ School _______________________
Please Print

The tie-breaker questions will be used to break ties between 1st, 2nd, and 3rd should a tie occur. They will be used in the order they are given.

Tie-Breaker #1

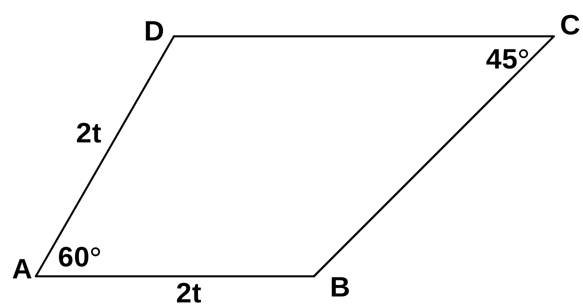
In the figure at the right AC = 30, AD = 42 and CB = 18. Determine the length CE.



Tie Breaker #1

Tie Breaker #2

In trapezoid ABCD, $\overline{CD} \parallel \overline{AB}$. If AB = AD = 2t, express CD in terms of the variable t.
Hint: Draw perpendiculars from C and D to $\overleftrightarrow{AB}$.

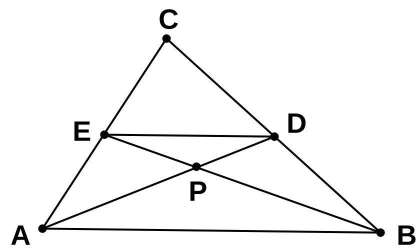


Tie Breaker #2

Name__________________________ School______________________
Please Print

Tie-Breaker #3

In ΔABC, D and E are midpoints of $\overline{BC}$ and $\overline{AC}$, respectively. $\overline{AD}$ and $\overline{BE}$ are medians of the triangle. What is the ratio of Area(ΔABC) to the Area(ΔPED)? Justify your answer.



Tie Breaker #3

Key – 2008 Geometry Exam

1.	D	14.	E
2.	D	15.	A
3.	A	16.	B
4.	C	17.	B
5.	A	18.	B
6.	C	19.	D
7.	B	20.	A
8.	C	21.	D
9.	E	22.	E
10.	A	23.	C
11.	D	24.	D
12.	D	25.	B
13.	B		

Tie Breaker Questions (**Key**)

Name ________KEY________________________ School__________________________
Please Print

The tie-breaker questions will be used to break ties between 1^{st}, 2^{nd}, and 3^{rd} should a tie occur. They will be used in the order they are given.

Tie-Breaker #1

In the figure at the right AC = 30, AD = 42 and CB = 18. Determine the length CE.

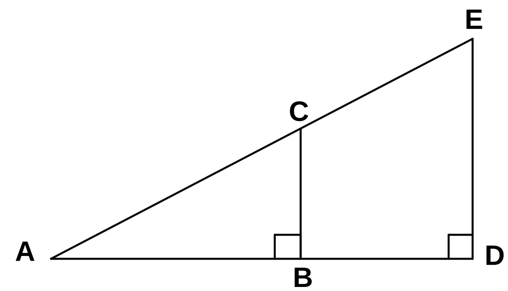
AB = $\sqrt{30^2 - 18^2}$ = 24

BD = 42 – 24 = 18

$\frac{x}{30} = \frac{18}{24}$

24x = 540

x = 22.5



Tie Breaker #1

Tie Breaker #2

In trapezoid ABCD, $\overline{CD} \parallel \overline{AB}$. If AB = AD = 2t, express CD in terms of the variable t.
Hint: Draw perpendiculars from C and D to $\overleftrightarrow{AB}$.

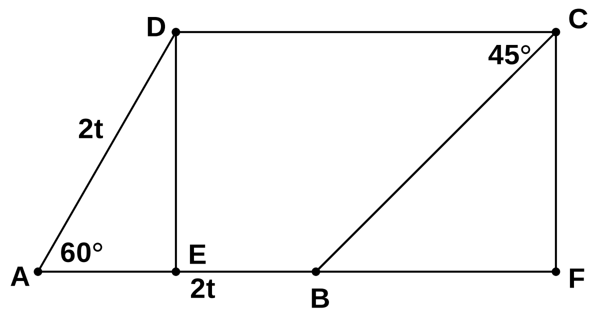
ΔADE is a 30^o – 60^o – 90^o triangle.

Therefore, DE = $t\sqrt{3}$ and CE = $t\sqrt{3}$

Since ΔBCF is a 45^o – 45^o – 90^o triangle,

BF = $t\sqrt{3}$.

Therefore, DC = EB + BF = t + $t\sqrt{3}$

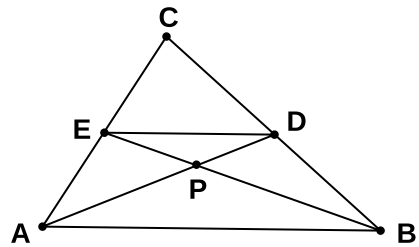


Tie Breaker #2

Name________KEY____________________ School______________________
Please Print

Tie-Breaker #3

In ΔABC, D and E are midpoints of $\overline{BC}$ and $\overline{AC}$, respectively. $\overline{AD}$ and $\overline{BE}$ are medians of the triangle. What is the ratio of Area(ΔABC) to the Area(ΔPED)? Justify your answer.



Tie Breaker #3

The medians of the triangle intersect in a point that divides the medians into segments that are in a 2:1 ratio.

Since ΔPED ~ ΔPBA then the 4Area (ΔPED) = Area(ΔPBA).

The altitude of ΔPBA to the side $\overline{AB}$ is one-third the altitude of ΔABC to the side $\overline{AB}$.

Therefore, 3 Area (ΔPBA) = Area(ΔABC).

Thus 12 Area (ΔPED) = Area(ΔABC).

So the ratio, Area(ΔABC) : Area(ΔPED) = 12 : 1.