

MU ALPHA THETA - MAINE '95

NAME: _____

CIPHERING - THETA DIVISION

STUDENT ID NUMBER: _____

TIME: CIRCLE ONE

0-60 secs.
12 pts.

60-90 secs.
8 pts.

90-120 sec.
4 pts.

ANSWER - QUESTION #1: _____

1. If $6x^2 + 29x + 35 = (ax + b)(cx + d)$. Find $ac + bd$.

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ANSWER - QUESTION #2: _____

2. Find the sum of the four largest numbers less than 100 which have an odd number of positive factors.

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ANSWER - QUESTION #3: _____

3. Express in simplest rational form.

$$\frac{\frac{\frac{1-5}{4-6}}{\frac{1+2}{2-3}}}{\frac{\frac{1-1}{2-6}}{\frac{2+3}{3+4}}}$$

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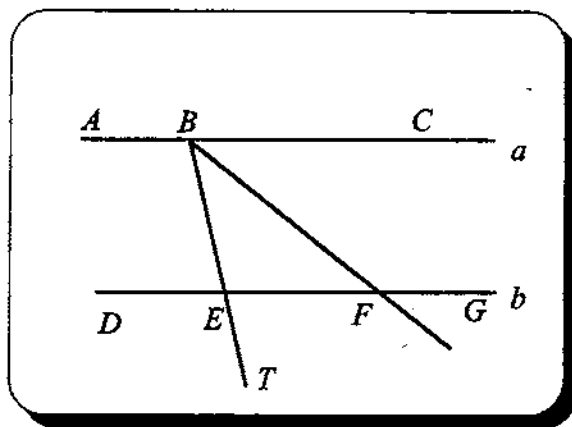
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ANSWER - QUESTION #4: _____

4. Given $a \parallel b$
 $\angle DET = 128^\circ$, BF bisects $\angle CBE$. Find $\angle EFB$, in degrees



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ANSWER - QUESTION #5: _____

5. Simplify to a single rational expression.

$$\frac{\frac{4x - \frac{1}{2}}{1 - \frac{2}{2x+1}}}{\frac{4x^2 + 4x + 1}{7x}}$$

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ANSWER - QUESTION #6: _____

6. If the radius of a circle is increased 100% by what percent is the area increased?

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ANSWER - QUESTION #7: _____

7. If $f(x) = (4x^3 - 3x^2 - x + 10) + (x^2 - 9)$, Find $f(-3)$.

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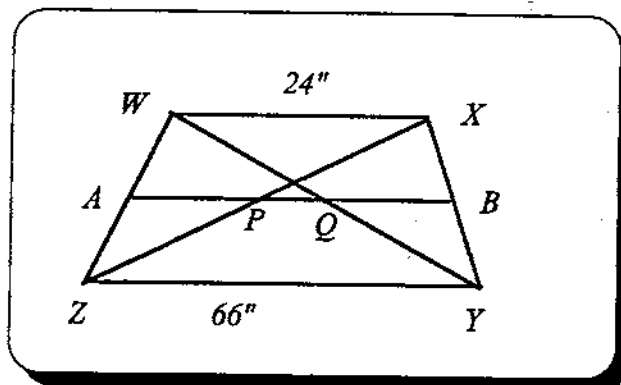
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ANSWER - QUESTION #8: _____

8. $WXYZ$ is a trapezoid. AB is a median. P is the point of intersection of line segments \overline{XZ} and \overline{AB} . Q is the point of intersection of line segments \overline{AB} and \overline{WY} . Find the numerical value of PQ .



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ANSWER - QUESTION #9: _____

9. If $N = \sqrt{(12)(98)(21)(k)}$ is a natural number. Find the smallest positive integral value for k .

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ANSWER - QUESTION #10: _____

10. Given $\triangle ACE$ where $BC = x - 4$; $AB = 2x - 4$; $CD = 7$; and $DE = x + 7$, then for what value(s) of x will ensure $\overline{BD} \parallel \overline{AE}$.

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ANSWER - QUESTION #11: _____

11. If $a * b = 4b - a$, and $c \# d = c^2 - d^2 + 1$, then $(1*9) \bullet (9\#5)$

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ANSWER - QUESTION #12: _____

12. Circles A, B, and C are externally tangent. $AB = 13$ units, $BC = 20$ units, and $AC = 17$ units. Find the length of the radius of Circle B.

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ANSWER - QUESTION #13: _____

13. Express as a single radical in simplest radical form.

$$\sqrt[3]{4} \cdot \sqrt{8}$$

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ANSWER - QUESTION #14: _____

14. Find the smallest positive perfect square number which has 2016 as a factor.

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ANSWER - QUESTION #15: _____

15. Express $\frac{3x^{-1}-y^{-2}}{x^{-2}+2y^{-1}}$ as a rational expression in lowest terms without any negative exponents.

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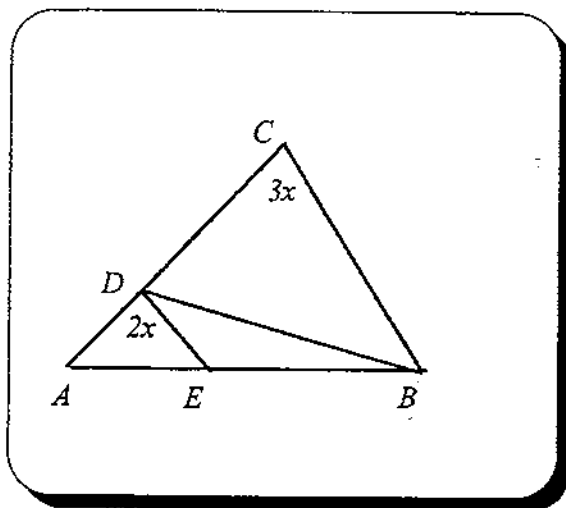
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ANSWER - QUESTION #16: _____

16. Given $\triangle ACB$. If $AE = DE$, $BE = BD = BC$, then $x =$



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ANSWER - QUESTION #17: _____

17. Find the distance from the center of $x^2 + y^2 = 8y - 6x$ and the vertex of $8y = (x - 3)^2 + 16$.

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ANSWER - QUESTION #18: _____

18. A horse and a wagon sold for \$120 each. The horse was sold at a loss of 25% of the cost and the wagon at a gain of 25% of the cost. How much was gained or lost on the entire transaction? Be sure to include the either the word **loss** or the word **gain** in your answer.

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ANSWER - QUESTION #19: _____

19. Find the area in square units of $\triangle ABC$ whose sides are 5, 8, and 11.

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ANSWER - QUESTION #20: _____

20. Solve for x:

$$x = 2 + \frac{15}{2 + \frac{15}{2 + \frac{15}{2 + \dots}}}$$