2001 MATH OLYMPICS

LEVEL I

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1. Write the solution of $\frac{5x+2}{3} > \frac{x+1}{3/4}$ in interval notation.

   a. $(-2,\infty)$ b. $(1,\infty)$ c. $(1,2]$ d. $(2,\infty)$ e. None of the above

2. A simplified form of the complex fraction $\frac{\frac{1}{x}+1}{-\frac{1}{x}+1}$ is

   a. $\frac{x-1}{x-1}$ b. $\frac{x+1}{x-1}$ c. $\frac{x+1}{1-x}$ d. $\frac{x-1}{1-x}$ e. None of the above

3. The greatest common factor in $15y^3z^3+27y^2z^4-36yz^5$ is

   a. $3yz^5$ b. $3yz^3$ c. $3y^3z^3$ d. $3y^3z^5$ e. None of the above

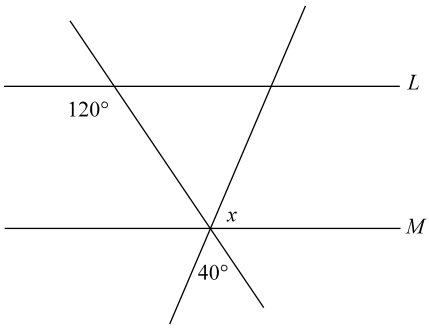
4. Ms. Letherman has been given a loan of \$5,000 for 1 year. If the interest charged is \$250, then the interest rate on the loan is

   a. 8% b. 5% c. (1/20)% d. 4% e. None of the above

5. In a bag there are six white balls and four black balls. Two balls are taken out at random, one at a time, with replacement. The probability that the *second* ball taken out is black is

   a. 40% b. 60% c. 16% d. 12% e. None of the above

6. If line L is parallel to line M, the size of the angle x is



a. 40°

b. 80°

c. 20°

d. 60°

e. None of the above

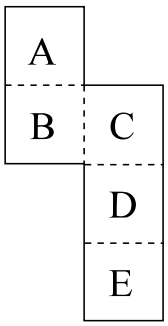
7. The standard form of the product $z=(2+i)(-3+2i)$ is given by

a. $z=-8+i3$ b. $z=-8-i3$ c. $z=-8$ d. $z=-8+i$ e. None of the above

8. The point (4,3) is reflected about the x-axis to a point P. Then P is reflected about the y-axis to point Q. What is the sum of the coordinates of Q.

a. 1 b. −1 c. 7 d. −7 e. None of the above

9. A piece of paper is cut out and labeled as shown in the diagram. It is folded along the dotted lines to make an open box. If the box is placed on a table so that the top of the box is open, then the label on the bottom of the box is



a. A b. B c. C

d. D e. E

10. The sum of the roots of $x^3+4x^2-7x-10=0$ is −4. What is the sum of the roots of $(x-3)^3+4(x-3)^2-7(x-3)-10=0$?

a. −13 b. −7 c. −1 d. 5 e. None of the above

11. How many possible triangles are there with angle measures $\alpha=35°$, $\beta=110°$, $\gamma=35°$.

a. none b. 1 c. 2 d. infinitely many e. None of the above

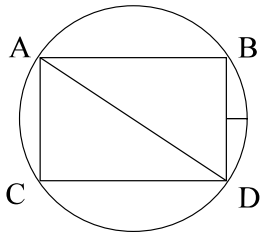
12. Simplify $\left(\frac{\frac{4}{x^2}-\frac{4}{y^2}}{\frac{20}{x}-\frac{20}{y}}\right)\left(\frac{30xy}{x+y}\right)$

a. $\frac{x+y}{5xy}$ b. $\frac{3x^2y^2}{x+y}$ c. $\frac{6xy}{x+y}$ d. 6 e. None of the above

13. The sum of an angle supplement and its complement is 6 more than 9 times the angle. How many degrees is the angle?

a. 20 b. 24 c. 30 d. 45 e. None of the above

14. In the diagram below, AB=CD. From this we can deduce that

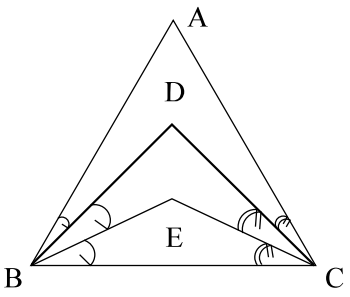


a. AB is parallel to CD b. AB is perpendicular to BD

c. AC=BD d. ∠ABD=∠BDC

e. None of the above

15. The corresponding trisectors of two angles ($\angle B$ and $\angle C$) of scalene triangle ΔABC meet at points D and E. The third angle of the triangle ($\angle A$) is 30 degrees. Find the measure of angle D.



a. 80 degrees b. 90 degrees c. 100 degrees

d. 130 degrees e. None of the above

16. If a rental car costs $25 per day plus 25 cents per mile, how far can you drive in one day for $70?

a. 180 miles b. 45 miles c. 300 miles d. 625 miles e. None of the above

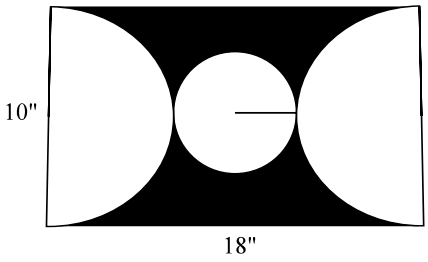
17. If the sum and difference of two positive numbers differs by 12, then one of the numbers must be:

    a. 0 b. 1 c. 6 d. 10 e. None of the above

18. The legs of a right triangle are 5 and 12. What is the length of the altitude to the hypotenuse?

    a. 13 b. $4\frac{8}{13}$ c. $2\sqrt{15}$ d. 4.15 e. None of the above

19. Find the shaded area.



    a. 180 square inches

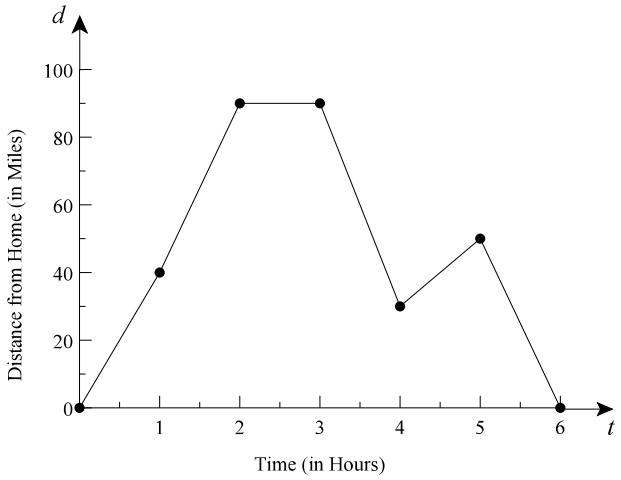
    b. $180-100\pi$ square inches

    c. $180-41\pi$ square inches

    d. $90-38\pi$ square inches

    e. None of the above

20. The graph describes a six–hour trip that Olivia recently took. What was her average speed?



    a. 15 mph

    b. 30 mph

    c. 36⅔ mph

    d. 40 mph

    e. None of the above

21. A square is inscribed in a circle which is inscribed in a square which is inscribed in another circle whose radius is 8. What is the length of the side of the innermost square?

    a. 2 b. $2\sqrt{2}$ c. 4 d. 8 e. None of the above

22. Dan, at 200 pounds, wishes to reduce his weight to 180 pounds in time to attend his high school reunion in 8 weeks. He learns that it takes 2400 calories per day to maintain his weight. A reduction of his caloric intake to 1900 calories per day will result in his losing weight at the rate of 1 pound per week. What should his daily caloric intake be to achieve his goal?

a. 1350 b. 1250 c. 1150 d. 1050 e. None of the above

23. Find the area of the shaded rectangle.

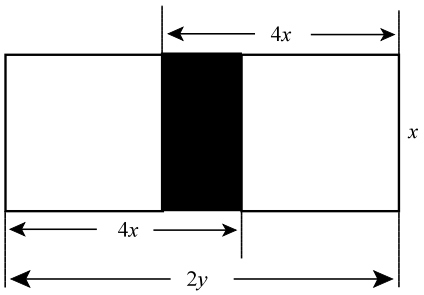
a. $4x^2 - xy$

b. $4x^2 - 2xy$

c. $8x^2 - xy$

d. $8x^2 - 2xy$

e. None of the above



24. Copy machines A and B, working together, can finish a job in 2 hours. Machine A, working alone, would require 3 hours to do the job. How long would it take machine B to do the job by itself?

a. 3 hours b. 4 hours c. 5 hours d. 6 hours e. None of the above

25. How many of these statements are true?

i. $12 \div \frac{1}{2} = 6$ iii. $\frac{1}{7} < \frac{1}{9}$

ii. 3%=0.3 iv. 0.2×0.4=0.8

a. None b. One c. Two d. Three e. Four