Section "Iztok" – UBM
Christmas Competition – 08.12.2007
11-12 grade

Time - 120 minutes

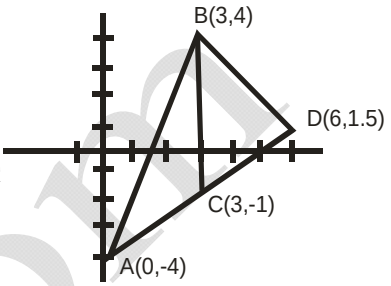
Rules: For each problem from 1 to 60 you receive1 point and there is only one correct answer. For each problem from 45 to 60 you have to write the correct answer.

Organizing committee wishes a successful work!

Name……**School**……**City**……..

1. $\frac{\sqrt{10}\sqrt{2}}{\sqrt{15}}=$

(A) 2/5 (B) $\frac{2\sqrt{5}}{5}$ (C) $\frac{\sqrt{3}}{6}$ (D) $\frac{2\sqrt{3}}{3}$ (E) $\frac{\sqrt{5}}{3}$

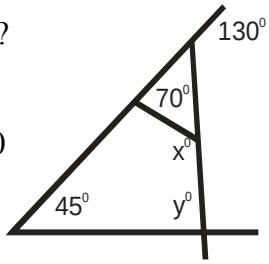


2. What is the relationship between the areas of ΔABC and ΔDBC in figure?
(A)Equal (B)Area ΔABC=1/2 Area of ΔDBC (C)Area of ΔABC> Area of ΔDBC
(D)Area of ΔABC+1= Area of ΔDBC (E) Area of ΔABC=1/3 Area of ΔDBC

3. If a≠-b, then $\frac{a-b}{a+b}$-1=

(A) 0 (B) $\frac{a-b-1}{a+b}$ (C) $\frac{-2b}{a+b}$ (D) $\frac{2a}{a+b}$ (E) $\frac{a^2+b^2}{a+b}$

4. If the given angles have the measures indicated in figure, what are the measures of x and y?
(A) $x=100^0$, $y=90^0$ (B) $x=120^0$, $y=85^0$ (C) $x=120^0$, $y=90^0$ (D) $x=110^0$, $y=90^0$

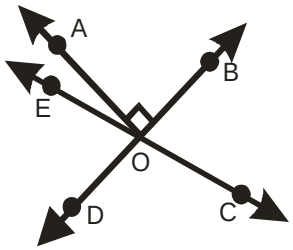


5. If 3+y=a and 3-y=a, then
(A) a=5, y=2 (B) a=1, y=-1 (C) a=2, y=-1 (D) a=3, y=1 (E) a=3, y=0

6. If 250 quadles = 1 dorple and 1750 septles =1 dorple, how many septles = 1 quadle?
(A) 3 (B) 7 (C) 17 (D) 30 (E) 70

7. If $\frac{x-1}{x+1}=\frac{2}{3}$ then x=
(A) 3 (B) 2 (C) No value possible (D) 4 (E) 5

8. In figure, if ray OA is perpendicular to line BD and ∠AOE has degree measure of 15, then the measure of ∠COD is
(A) 75 (B) 95 (C) 100 (D) 105 (E) 100

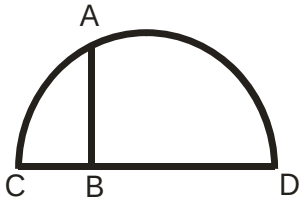


9. If $4^{x/2}=16$, then x=
(A) -2 (B) 1 (C) 2 (D) 4 (E) -4

10. If $\frac{x^2-1}{3}=5$ and $y\left(\frac{x^2-1}{3}\right)=15$, then y=

(A) 5 (B) 3 (C) $\sqrt{3}$ (D) 15 (E) Cannot be determined

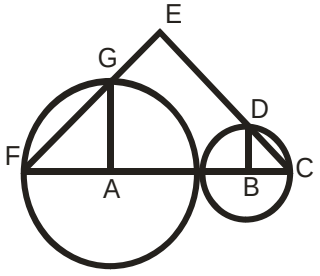
11. cosx-(sin(90^0-x))=
(A) 0 (B) 1 (C) -1 (D) .87 (E) .5



12. In figure, arc CD is a semicircle. AB ⊥ CD, BC=3, BD=4. Then the length of AB=
(A) 3.46 (B) 4.42 (C) 3 (D) 4 (E) 5

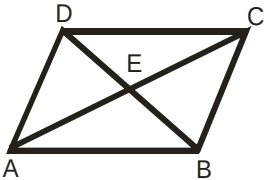
13. If $(b+c)(ab-ac)=b^2-c^2$, then a=
(A) 0 (B) 1 (C) -1 (D) b (E) c

14. If x=2, y=3, and z=4, then $\frac{x^3+yz^2}{-2(2-3y)}=$
(A) 5 (B) -5.6 (C) -5 (D) 5.6 (E) 4



15. If the radii of the circles in figure are 5 and 3, the centers are A and B and both ∠GAF and ∠DBC are right angles, what is perimeter of ΔCEG?
(A) 32 (B) 38.63 (C) 30 (D) 27,63 (E) Cannot be determined

16. If ABCD in figure is a parallelogram and is positioned in the coordinate plane so that A=(1,1), B=(4,2), and E=(3,3), then D is

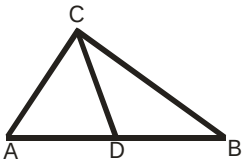


(A)(-4,-2) (B) (-4,2) (C) (2,4) (D) (2,-4) (E) (-2,-4)

17. In figure, if AD=2 and DB=3, then the ratio $\frac{area\Delta ADC}{area\Delta ABC}$ is

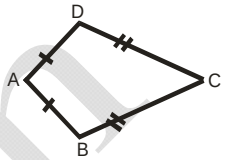
(A) 2/3 (B) 3/2 (C) 2/5 (D) 3/5 (E) 5/3

18. If $f\left(\frac{1}{x}\right)$=2x, what is f(x)?



(A) 2/x (B) x/2 (C) 1/(2x) (D) 2 (E) Cannot be determined

19. In figure, ∠D and ∠B are right angle, AD=AB, BC=DC, and AB≠BC. How many circles can be drawn that contain A, B, and C, but not D?



(A) None (B) 1 (C) 2 (D) 3 (E) Infinitely many

20. If $\left(x-\frac{1}{2}\right)\left(x-\frac{3}{2}\right)$<0, then the greatest negative value for x is

(A) -1 (B) -1/2 (C) -3/2 (D) 0 (E) No negative value of x will make the inequality true

21. The graphs of which of the following are the same?

I. $y=\frac{1}{2}x+\frac{1}{2}$ II. $y+1=\frac{1}{2}(x+3)$ III. $y-2=\frac{1}{2}(x-3)$

(A) I and II only (B) None (C) II and III only (D) I and III only (E) I, II, and III

22. In 10 minutes, the number of degrees the hour hand of a clock rotates is

(A) 1 (B) 6 (C) $6\frac{2}{3}$ (D) 5 (E) 10

23. If $\frac{1}{x}+\frac{1}{\sqrt{x}}$=0, then x=

(A) 0 (B) 1 (C) -1 (D) 111 (E) No real value possible

24. (sinx)(cosx)=1 when x=

I. 0 II. π/4 III. All real numbers

(A) I only (B) II. only (C) I and II only (D) none (E) all

25.If 1/x<1/2, then

(A) x>2 (B) x>2 or x<2 (C) x>2 and x<2 (D) x>2 or x<0 (E) x is any real number except zero

26. If k+1 represents a given odd integer, which of the following must also be an odd integer?

(A) 2(k+1) (B) k(k+1) (C) (k+1)(k+2) (D) (k+1)(k-1) (E) $(k+1)^2$-1

27. If $(a^2-3a)(a+3)=0$ then a=

(A) {3} (B) {-3} (C) {3,-3} (D) {0,3,-3} (E) {0,-1,3,-3}

28. If the right angles and sides are as marked in figure, the area of trapezoid ABCD is 18, and a=2b, then c=

(A) 4.47 (B) 8.94 (C) 4 (D) 2 (E) Cannot be determined

29. If(x) = $-1/x^3$ and x takes on successive values from -10 to -1/10, then

(A) f(x) increases throughout (B) f(x) decreases throughout (C) f(x) increases, then decreases (D) f(x) decreases, then increases (E) f(x) remains constant throughout

30. If in a ΔABC, ∠C is a right angle, BC=1, and tan∠B=p, then cos∠A=

(A) $\frac{1}{\sqrt{p^2+1}}$ (B) $\frac{p}{p+1}$ (C) $\frac{p}{\sqrt{p^2+1}}$ (D) $\frac{\sqrt{p^2+1}}{p}$ (E) p^2+1

31. A gold bar with dimensions 2'x3'x4' has all of its faces rectangular. If it is melted and recast into three cubes of equal volumes, what is the length of an edge of each cube?

(A) 1 (B) 2 (C) 3) (D) 4 (E) 5

32. If n!/2=(n-2)! Then n=

(A) 1 (B) 2 (C) 3 (D) 4 (E) 5

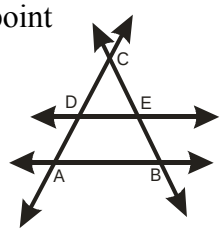
33. If log x=$\frac{1}{2}$ log a-log b and $a=4b^2$, then x=

(A) 1 (B) 2 (C) 4 (D) 8 (E) 16

34. If p, m, and n are prime numbers, none of which is equal to the other two, what is the greatest common factor of $24pm^2n^2$, $9pmn^2$, and $36p(mn)^3$?

(A) 3pmn (B) $3p^2m^2n^2$ (C) $3pmn^2$ (D) $3pmn^2n^2$ (E) $3pmn^3n^3$

35. If the perpendicular bisector of the segment with endpoints A (1,2) and B (2,4) contains the point (4,c), then the value of c is



(A) 7) (B) 7/4 (C) -7 (D) 4 (E) -4

36. If f(x) =1/x and f[f(x)]=f(x), then x is

(A) 1 only (B) -1 only (C) 1 or -1 (D) no real number (E) any real number

37. If in figure, line DE is parallel to line AB, and CD=3 while DA=6, which of the following must be true?

I. ΔCDE~ΔCAB II. $\frac{Area\Delta CDE}{Area\Delta CAB}=\left(\frac{CD}{CA}\right)^2$ III. If AB=4, then DE=2

(A) I only (B) II only (C) III only (D) II and III only (E) I and II only

38. If x=3i, y=2i, and z=1+i, then xy^2z=

(A) 0 (B) -1 (C) 1-i (D) 12-12i (E) 6-6i

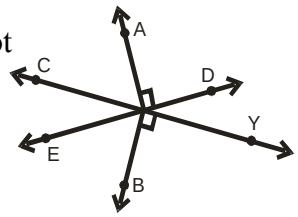
39. If $a<b$, then each of the following is true for all a and b EXCEPT

(A) $-a<|b|$ (B) $-a>-b$ (C) $-b^2<a^2$ (D) $-a^2<b^2$ (E) $0>b-a$

40. A singer has memorized 12 different songs. If every time he performs he sings any three of these songs, how many different performances can he give?

(A) 4 (B) 12 (C) 110) (D) 220 (E) 440

41. In figure, the measure of ∠AOD and ∠BOY is 90, and the measure of ∠DOY is between 40 and 50. What is the range of possible values of the measure of ∠AOC?



(A) 30 to 40 (B) 40 to 50 (C) 50 to 60 (D) 40 to 60 (E) Cannot be determined

42. If a circle is tangent to be both the x- and y-axis and has a radius of 1, then its equation is

(A) $(x-1)^2+(y+1)^2=1$ (B) $x^2+y^2=1$ (C) $x^2+(y+1)^2=1$ (D) $(x+1)^2+y^2=1$ (E) $(x-1)^2+y^2=1$

43. If two planes P_1, and P_2, are parallel, then

(A) Any line in P_1 is parallel to any line in P_2 (B) AB=CD whenever A and C are in P_1 and B and D are in P_2 (C) Any line that intersects P_1 in exactly one point will intersect P_2 in exactly one point (D) Any line parallel to P_1 will intersect P_2 (E) Any line that intersects P_1 in more that one point must intersect P_2 in more than one point

44. If $\tan\frac{y}{2}=\sin\frac{y}{2}$ and $0\le\frac{y}{2}\le\frac{\pi}{2}$, then cos y =?

(A) 0 (B) 1) (C) -1 (D) ½ (E) $-\sqrt{2}/2$

45. The number of points in the intersection of the graphs of y=|x+2| and y=-|x|+2 is

(A) Infinitely many (B) A finite but indeterminable number (C) 3 (D) 2 (E) 0

46. If sin x>0 and cos x=-8, then tan x=

(A) .6 (B) -.6 (C) 1.33 (D) -.75 (E) -1.33

47. If $x=\sqrt{yz}$, x>0, y>0, and z>0, then log y=

(A) $\frac{x^2}{z}$ (B) $\frac{\log x^2}{\log z}$ (C) $\frac{2\log x}{\log z}$ (D) $2logx-logz$ (E) $2(log\ x-log\ z)$

48. A parallelogram has an area of 36 square feet and two sides of lengths 6 feet and 9 feet. Which of the following is the sine of an angle of the parallelogram?

(A) 2/3 (B) 3/2 (C) 4/9 (D) 5/9 (E) -5/6

49. Three cards, Card One, Card Two, and Card Three, are drawn from a desk. One of these is a queen, one an ace, and one a king. One and only one of the following statements is true.

I. Card Two is NOT a queen II. Card Three IS a queen III. Card One is NOT an ace

Based on this information, which of the following is true?

(A) Card One is a queen (B) Card One is an ace (C) Card Two is a king (D) Card Three is an ace (E) Card Three is a queen

50. If a cube has an edge of length 10, then the length of the segment connecting the center of a face of the cube to any vertex not contained in the plane of that face is

(A) $\sqrt{6}$ (B) $5\sqrt{6}$ (C) $6\sqrt{5}$ (D) $3\sqrt{5}$ (E) $10\sqrt{6}$

1-d; 2-a; 3-c; 4-b; 5-e; 6-b; 7-e; 8-d; 9-d; 10-b; 11-a; 12-a; 13-b; 14-e; 15-d; 16-c; 17-a; 18-a; 19-a; 20-e; 21-e; 22-d; 23-e; 24- ; 25-d; 26-d; 27-d; 28-a; 29-a; 30-c; 31-b; 32-b; 33-b; 34-c; 35-b; 36-e ; 37-e; 38-e; 39-e; 40-d;