**Section "Iztok" – UBM**
**Christmas Competition – 13.12.2008**
**11-12 grade**

**Time - 120 minutes**

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

**Organizing committee wishes a successful work!**

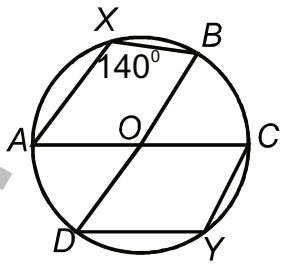
1. If $\log_{10}(x+4)+\log_{10}(x-4)=1$, then $x=$

A) -2.45 B) 5.1 C) 5 D) 2.45 E) 1.25

2. An equation for the line containing the point (-2;1) and parallel to $4x-2y=3$ is

A) $y=2x+5$ B) $y=2x-1$ C) $y=x-2$ D) $y=0.5x$ E) $y=2x-2$

3. Point $O$ is the center of the circle in the figure. The measure of arc $XB$ is 1/3 the measure of arc $AB$, and the measure of arc $YC$ is 1/2 the measure of arc $DC$. If the measure of $\angle AXB$ is 140, then the measure of $\angle DYC$ is




A) 120 B)140 C)135 D) 145 E)137.5

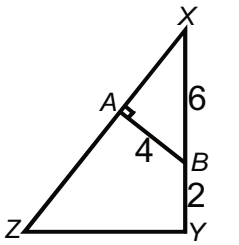
4. If $f(a)=2^a$, then $\log_2 f(a)=$

A) 2 B) $f(a)$ C) $a$ D)$1/2^a$ E) $a^2$

5. Which of the following is the set of all points in space that are equidistant from two given points?

A) A sphere B) An ellipse C) A parabola D) A plane E)A line

6. In the figure, both $\angle XAB$ and $\angle XYZ$ are right angles, $XB=6$, $BY=2$, and $AB=4$. The ratio of (area of $\Delta XAB$):(area of $\Delta XYZ$) is




A) 3/5 B) 5/16 C) 9/25 D) 4/5 E) 3/25

7. The range of $f(x)=-0.25\sin 4x$ is

A) $-.25\le y\le 0$ B) $-.25\le y\le .25$ C) $0\le y\le .25$ D) $-1\le y\le 1$ E) $-4\le y\le 4$

8. Three planes, $E$, $F$, and $G$, intersect so that each is perpendicular to the other two. A segment $AB$ is positioned so that the length of its projection on the intersection of $E$ and $F$ is 1, on the intersection of $E$ and $G$ is 3. What is the length of $AB$?

A) 3.16 B) 4 C) 5 D) 6 E) 3.46

9. A bag contains seven marbles, three red and four green. If three marbles are drawn from the bag at random, what is the probability that all three will be red?

A)3/35 B) 3/7 C) 1/35 D) 3/4 E) 3/7

10. The values of $m$ for which the following has no real value defined $\dfrac{1}{\dfrac{m^2-m-2}{m^2-4}}$

A){–2;–1} B) {–1;2;–2} C) {–2;2} D) {–1;2} E) {1;–1;2;–2}

11. If $\log_{10}(x-5)>0$, then

A) $x>5$ B) $x>6$ C) $x>1$ D) $x>0$ E) $x<5$

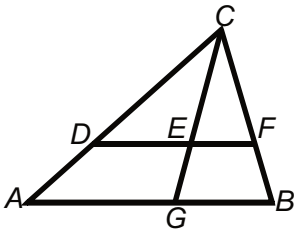
12. If one solution for $x^3+2x^2+x+2$ is $i$, where $i=\sqrt{-1}$, which of the following sets contains all other solutions?

A) {–$i$} B) {–$i$;2} C) {–$i$;–2} D) {–2;2} E) {2}

**13.** If $216\times 1728\times 5832=x^3$, what is the value of $x$?

A) 576 B) 1344 C) 784 D) 3072 E) 1296

14. In the figure $DF\|AB$, $BC\perp AB$, $BC=5$, $BG=4$, $BA=12$, $DA=3$, $CE=$




A) 5.44 B) .54 C) 1.09 D) .42 E) 4.93

15. The axis of symmetry of $y=-3x^2+12x-9$ is

A) $x=3$ B) $x=-3$ C) $x=6$ D) $x=-3$ E) $x=2$

16. If $z=7-24i$, then $|z|=$

A) 5 B) 17 C) 31 D) 168 E)25

17. The expression $\dfrac{a^{-1}-b^{-1}}{a^{-2}-b^{-2}}=$

A) $\dfrac{b-a}{ab}$ B) $\dfrac{b+a}{ab}$ C) $\dfrac{ab}{b+a}$ D) $\dfrac{a^2-b^2}{a-b}$ E) $a-b$

18. The radian measure of an angle of $16^0$ is

A) .0889 B) 50.27 C) .2793 D) 35.34 E) 11.25

19. For what real values of $x$ and $y$ is the following equation $x-y+2i=6+(x+y)i$ true? A) (4;–2) B) (1;2) C) (2;4) D) (3;1) E) (3;2)

20. If $x>0$ and $\log_{3x}27=1$, then $x=$

A) 9 B) –1/3 C) –3 D) 1/3 E) 3

21. Which of the following is a point in the intersection of $x^2+y^2<4$ and $x-3y<-3$
A) (0;1) B) (1;–1) C) (1;0) D) (–1;1) E) (0;0)

22. If $n$ is the number of any term, the $n$-th term of the geometric sequence $2\sqrt{2}, 8, 16\sqrt{2}, \ldots$ is
A) $n\sqrt{2}$ B) $\left(n\sqrt{2}\right)^2$ C) $\left(2\sqrt{2}\right)^n$ D) $\left(2\sqrt{2}\right)^{n+1}$ E) $\left(2\sqrt{2}\right)^{n-1}$

23. Which of the following is a point of intersection of the graphs of $y=0.5\sin 2x$ and $y=0.5$?
A) $(45^0;0.5)$ B) $(60^0;0.5)$ C) $(90^0;0.5)$ D) $(180^0;0.5)$ E) $(360^0;0.5)$

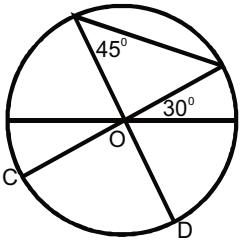
24. The graph of $xy=0$ is
A) a point B) a line C) a pair of intersecting lines D) a pair of parallel lines E) a hyperbola

25. If 40 percent of a 20-gallon solution is alcohol, how many QUARTERS of water must be added to make a new solution that is 25 percent alcohol?
A) 60 B) 48 C) 36 D)24 E) 12

26. If $y^2-9x^2=25$, then the maximum negative value of $y$ is
A) –25 B) –1 C) –5 D) –5/3 E) The maximum negative value cannot be determined

27. Which of the following is of $x^2-(y+1)^2$?
A) $x-y-1$ B) $y+1$ C) $x-1$ D) $x-y$ E) $x-y+1$

28. If $O$ is the center of the circle in figure, then the degree measure of minor arc $CD$ is
A) $180^0$ B) $45^0$ C) $90^0$ D) $135^0$ E) $75^0$




29. If $p$ and $q$ are the coordinates of points on the number line, the distance between the points will always be
A) $p-q$ B) $q-p$ C) $-(p-q)$ D) $|p-q|$ E) $\sqrt{p^2+q^2}$

30. If $f(x)=|x-1|$ and $g(x)=1-x^2$, then $3f(-2)+4g(-3)=$
A) -23 B) -5 C) 13 D) 32 E) -13

31. Which of the following is the degree measure of an angle in standard position and co-terminal with an angle of $-8^0$?
I. $352^0$ II. $8^0$ III. $-368^0$
A) I only B) I and III only C) II only D) II and III only E) I, II and III

32. Assuming that $a$ and $b$ are both NEGATIVE numbers, in which quadrant does the point $(a;-b)$ lie?
A) I B) II C) III D) IV E) Cannot be determined.

33. What is the radian measure of a central angle that cuts off an arc $\pi$ inches long on a circle of radius 2 inches?
a) 1/2 B) $\pi/2$ C) $\pi/4$ D)$\pi$ E) 2

34. Which of the following is equal to $y^{1/2}(y^{1/2}+y^{-1/2})$?
A) $y+1$ B) $y$ C) 1 D) 0 E) $1/y$

35. If $\log_3(1+y)^2=2$, then $y=$
A) 1 B) 2 C) 3 D) 4 E) 5

36. Which of the following is equal to $(\tan\theta)(\csc\theta)$?
A) $\sin\theta$ B) $\cos\theta$ C) $\sec\theta$ D) $\csc\theta$ E) $\cot\theta$

37. If a solid sphere of radius 1 foot is melted and recast to form spheres of radius 1 inch, how many of these smaller spheres can be made?
A) 12 B) 36 C) 144 D) 432 E) 1728

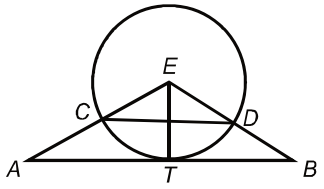
38. The average (arithmetic mean) score of the two forwards on a basketball team was 21 pts. The average scores of the remaining three players were 11. What was the average score of all 5 players on the team?
A) 15 B) 16 C) 5 D) 15.5 E) 14.5

39. In $\Delta ABC$, if $AB=6$, $AC=4$, and the degree measure of $\angle A$ is 30, the area of the triangle is
A) 2 B) 3 C) 6 D) 12 E) The area cannot be determined

40. If $\log a=.4771$ and $\log b=.3010$ then $\log ab$.
A) .7781 B) .1761 C) .6532 D) .6990 E) .5229

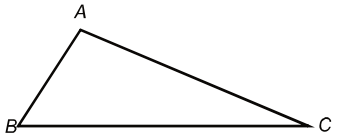
41. What is the number of square inches in the area of the base of a right circular cone with a volume $40\pi$ cubic inches and a height of 6 inches?
A) $40\pi$ B) $20\pi$ C) $10\pi$ D) $5\pi$ E) $40\pi$

42. In the figure, line $AB$ is tangent to the circle at $T$. Radius $ED$ has length 6. $TE\perp CD$ and ray $ET$ bisects $\angle AEB$, $AB=$
A) 6 B) 5 C) 12 D) 9 E) Cannot be determined




43. Which of the following is the equation of a line that is neither parallel nor perpendicular to the line defined by $y+x=0$?
A) $y=x$ B) $y=x+12$ C) $y-x+2=0$ D) $2y-2x=1$ E) $2y=4x+1$

44. If $t$ can represent any positive integer, then
A) $\sqrt{t}$ is always irrational B) $\sqrt{t}$ is not always real C) $t^2$ is always an even integer



D) $2t+1$ is always an odd integer E) $t/3$ is never an even integer

45. If a point $X$ lies in the interior of $\Delta ABC$ and $\measuredangle BAC > 90^{\circ}$ in the figure, then which of the following must be true?
A) $BX<BA$ B) $BX>BA$ C) $BX=BA$ D) $BX\leq BA$ E) $BX<BC$

46. **If** the measures of the exterior angels of a certain polygon are added and this sum is divided by the number of sides of the polygon, the results is 18. Now many sides does the polygon have?
a) 36 B) 24 C) 20 D) 12 E) 10

47. What is the middle term in the expansion of $\left(2x-\frac{1}{2}y\right)^6$ ?
A) $-20x^3y^3$ B) $-80x^2y^4$ C) $-20x^2y^4$ D) $-80x^3y^3$ E) $-20x^4y^4$

48. Which of the following completely describes the symmetry of $\{(x,y):|x|=2\}$?
A) $x$-axis only B) $y$-axis only C) $x$-axis and $y$-axis only D) Origin, $x$-axis and $y$-axis E) Origin only

49. The number of oranges in 8 crates of 24 each is the same as the number of oranges in
A) 4 crates of 48 each B) 2 crates of 36 each C) 6 crates of 12 each
D) 3 crates of 75 each E) 7 crates of 410 each

50. If $D=R.T$, then $D=6$ and $T=.5$, $R=$
A) 12 B) 3 C) 6 D) 6.5 E) 15

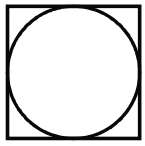
51. If $A$ is an angle in standard position, $\sin A$ is positive and $\cos A$ is negative, in what quadrant is the terminal side of angle $A$?
A) I B) II or III C) II D) IV E) III or IV

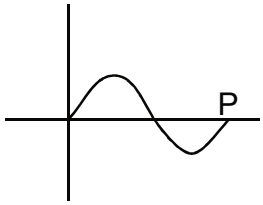
52. If $\frac{x+5}{x-1}=\frac{x}{x-5}$, then $x=$
A) –5 B) 25 C) 0 D) 1 E) 10

53. If $5x-4=2x+8$, what does $3x=$?
A) 12 B) 4 C) 8 D) –4 E) 2

54. If you are given that each of two angles of a triangle is acute, what conclusion can you draw about the third?
A) It is obtuse B) It is a right angle C) It is acute D) It cannot exist since the triangle is impossible
E) It can have any measure between 0 and 180

55. If the area of the square in figure is 9, then the area of the circle is
A) 28.3 B) 9.4 C) 7.1 D) 4.7 18.8





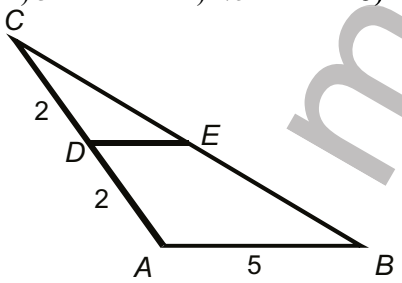

56. The graph of one cycle of $y=3\sin(.5x)$ is given in the figure. What is the $x$-coordinate of $P$?
A) $90^0$ B) $180^0$ C) $360^0$ D) $720^0$ E) $1080^0$

57. Which of the following is the general term on the sequence 11, 9, 7, …, where $n$ is the number of the term?
A) $n$ B) $11+n$ C) $11-2n$ D) $11-2(n-1)$ E) $n-2$

58. The minimum value of $f(x)=x^2+x+4$ is
A) 2 B) –2 C) 4 D) 15/4 E) 17/4

59. If $\cos x=-.9287$, then $\cos(x+180^0)=$
A) –.9287 B) .9287 C) .0713 D) –.0713 E) –1.8574

60. If $DE$ is parallel to $AB$, and the length of the sides are as shown in the figure, what is the length of $DE$?
A) 3 B) 4/5 C) 1.25 D) 2.5 E) 2



Отговори:

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|---|---|---|---|---|---|---|---|---|---|
| 1B | 2A | 3B | 4C | 5B**D** | 6B | 7B | 8 **A** | 9C | 10B |
| 11B | 12C | 13E | 14E | 15E | 16E | 17C | 18C | 19A | 20A |
| 21C | 22C | 23A | 24C | 25B | 26**A** | 27A | 28C | 29D | 30A |
| 31B | 32B | 33B | 34A | 35B | 36C | 37E | 38**A** | 39C | 40A |
| 41B | 42E | 43E | 44D | 45E | 46C | 47A | 48**D** | 49A | 50A |
| 51C | 52B | 53A | 54E | 55C | 56D | 57D | 58D | 59B | 60D |