2004 Mu Alpha Theta Convention
Hustle: Algebra/Geometry

1. The volumes of two similar solids are 250 and 686. Find the scale factor for the two solids.
Solution: Volume ratio is 125/343, so scale factor is <u>5/7</u>

2. Find the area of a circle inscribed in a square of area 50.
Solution: Side length of the square is $5\sqrt{2}$, so this is the diameter of the circle; circle has area <u>25π/2</u>

3. Triangle PQR is isosceles with vertex angle P. If m∠Q = (5x)° and m∠P = (2x)°, find x.
Solution: 2x + 5x + 5x = 180; x = <u>15</u>

4. The dimensions of a right rectangular prism are in a ratio of 1:2:5. Find the total surface area (in m^2) of the prism if its volume is 640 m^3.
Solution: x(2x)(5x) = 640; x = 4 so dimensions are 4, 8, 20 and thus total surface area is <u>544</u> (or 544 m^2)

5. If (3, 4) is a point on the line y = mx – 5, find the value of m.
Solution: 4 = m(3) – 5; m = <u>3</u>

6. If $10x^2 + x – 24$ is factored as (ax + b)(cx + d), what is abcd?
Solution: ac = 10 and bd = -24, so <u>-240</u>

7. 85 is 125% of what number?
Solution: 85 = (5/4)x; x = <u>68</u>

8. Find the area of an isosceles trapezoid with legs with length 10 and bases with lengths 8 and 20.
Solution: height will be 8, so area = <u>112</u>

9. Find the area of a square with diagonal 20.
Solution: area = ½(20)(20) = <u>200</u>

10. Find the slope of a line perpendicular to the line containing the points (8, 2) and (-5, 3).
Solution: m = -1/13, so perpendicular m=<u>13</u>

11. Find the sum of the positive solutions to the equation $x^4 – 13x^2 + 36 = 0$.
Solution: $(x^2 – 4)(x^2 – 9) = 0$ has 2, 3 as positive solutions, so <u>5</u>

12. If y varies directly as x and when x is 4, y is –2, find the value of x when y is 4.
Solution: -2 = k(4) so k = -1/2; 4=(-1/2)x means x = <u>-8</u>

13. Find the point of intersection for the lines x + y = 11 and y = x – 7.
Solution: x + x – 7 = 11 means x = 9; y = 2 so <u>(9, 2)</u>

14. Find the volume, in cubic units, of a right cylinder with total surface area 72π square units if the length of the radius is also the height of the cylinder.
Solution: $2πr^2 + 2πr(r) = 72π$ means r = $3\sqrt{2}$ so volume is <u>$54π\sqrt{2}$</u>

15. The hypotenuse of a 30-60-90 triangle is 8. Find the area of the triangle.
Solution: legs are 4 and $4\sqrt{3}$ so area is <u>$8\sqrt{3}$</u>

16. Find the product of all values of x such that $|x|^2 – 6|x| + 8 = 0$.
Solution: (|x| - 4)(|x| - 2) = 0 so x = 4, -4, 2, -2 for a product of <u>64</u>

17. Movie ticket prices increased from $5.25 to $6.30 over the summer. What was the percent increase in price?
Solution: 1.05/5.25 = <u>20%</u>

18. How many integral solutions exist for the inequality |2x + 7| ≤ 15?
Solution: -15≤2x + 7≤15 means –11≤x≤4 so there are <u>16</u> integral solutions

19. The hypotenuse of a right triangle has length 8 and one of the legs has length 6. What is the length of the remaining leg?
    Solution: $64 - 36 = x^2$; $x = 2\sqrt{7}$

20. Find the area of the closed figure formed by the x-axis and the graph of $y = |x| - 6$.
    Solution: Triangle with base 12 and height 6, so area is <u>36</u>

21. A circle is inscribed in a square. A point inside the square is chosen at random. Find the probability that the point chosen is inside the square and outside the circle.
    Solution: Area of the square = s^2; radius of the circle = s/2, so area of the circle is $\pi(s^2/4)$ making the probability <u>$1-\pi/4$ or $(4-\pi)/4$</u>

22. Find the degree measure of one interior angle of a regular nonagon.
    Solution: exterior angle = $360/9 = 40$, so interior angle is <u>140</u>

23. Find the area of an equilateral triangle with perimeter 24.
    Solution: side length is 8, so area is <u>$16\sqrt{3}$</u>

24. The base of an isosceles triangle has length 10, and each leg has length 13. Find the length of the altitude drawn to the base of the triangle.
    Solution: Pythagorean triple; <u>12</u>

25. Find the larger solution to the equation $x^2 - 4x - 1 = 0$.
    Solution: By quadratic formula, <u>$2 + \sqrt{5}$</u>

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Answers

#	Answer	#	Answer
1	$\dfrac{5}{7}$	15	$8\sqrt{3}$
2	$\dfrac{25\pi}{2}$	16	64
3	15	17	20%
4	544	18	16
5	3	19	$2\sqrt{7}$
6	-240	20	36
7	68	21	$1-\dfrac{\pi}{4}\ \text{or}\ \dfrac{4-\pi}{4}$
8	112	22	140
9	200	23	$16\sqrt{3}$
10	13	24	12
11	5	25	$2+\sqrt{5}$
12	-8		
13	(9,2)		
14	$54\pi\sqrt{2}$		