Georgia Southern University
Invitational Mathematics Tournament
2003 Junior High Written Exam

Name _____

School _____

Directions:

1. Do not open this test booklet until you are told to do so.
2. Use only a #2 lead pencil.
3. No calculators, slide rules, notes or other aids of any kind may be used.
4. Scratch paper is stapled to the back of the test booklet.
5. This a is a 40 question multiple-choice exam. You will be allotted 60 minutes to complete the exam.
6. Geometric figures are not necessarily drawn to scale.
7. Your score will be determined by the formula $40 + 4R - W$ where $R =$ number of questions answered correctly and $W =$ number of questions answered wrong. There is no penalty for questions left unanswered.
8. Tie-breakers will be taken from the written exam in order of difficulty. The order will be determined by the number of people that answered each question correctly, with the question(s) correctly answered by the fewest people considered first.

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1. 25% of 200 is what number?

   (a) 8

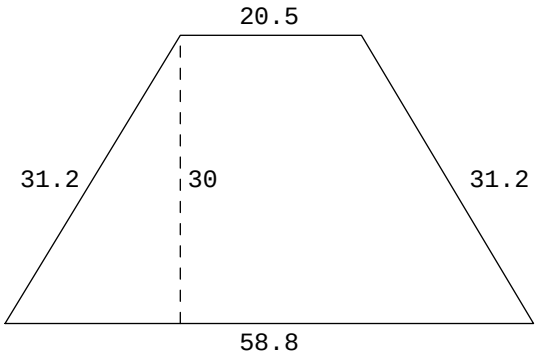
   (b) 800

   (c) 5

   (d) 50

   (e) 500

2. Find the perimeter of the following trapezoid.



   (a) 100.70

   (b) 141.70

   (c) 1764.00

   (d) 936.00

   (e) 171.70

3. If $5(x-9)+3x+4=7$, find $2x-3$.

   (a) 0

   (b) 2

   (c) 5

   (d) 9

   (e) 15

4. Evaluate $4\left(\frac{3}{8}+\frac{1}{2}\right)+\frac{7}{2}$.

   (a) 35/10
   (b) 14/4
   (c) 7/2
   (d) 14
   (e) 7

5. The salary for the President of the United States is approximately $400,000 per year. Suppose a person working in retail makes $13,000 per year. For how many years would the person working in retail have to work to earn at least as much money as the President of the United States earns in 1 year?

   (a) 30 years
   (b) 31 years
   (c) 32 years
   (d) 33 years
   (e) 34 years

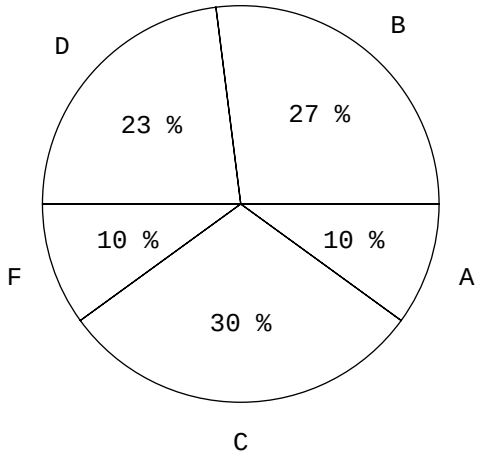
6. Compute $(3.1 \times 10^5)\,(4.5 \times 10^{-3})$ and write the product in scientific notation.

   (a) 1.395×10^3
   (b) 1.395×10^2
   (c) 1.395×10^1
   (d) 13.95×10^2
   (e) 1395×10^3

7. Evaluate $\dfrac{-30+[18 \div (5-14)+4^2]}{25-3^2+(-8)}$.

   (a) -2
   (b) $-3/2$
   (c) 8/13
   (d) 2/3
   (e) 2

8. The following pie graph shows the percent of students in a class of 45 students who earned a grade of A, B, C, D, or F.



Which of the following choices is the best approximation of the number of students who earned a grade of C?

(a) 5
(b) 10
(c) 12
(d) 14
(e) 20

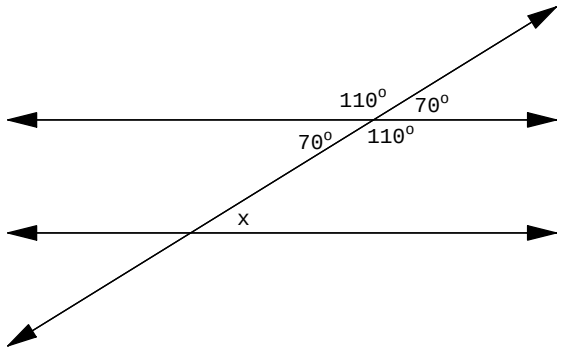
9. Which number is not equal to the others?

(a) $3^2 \cdot 2^2 \cdot 10 \cdot 15$
(b) $3^2 \cdot 2^2 \cdot 5^2 \cdot 6$
(c) $3^3 \cdot 2^3 \cdot 10 \cdot 25$
(d) $3^2 \cdot 2^3 \cdot 5 \cdot 15$
(e) All are the same

10. The sentence $-6\,(m+n) = -6\,(n+m)$ illustrates the

(a) commutative property of addition.
(b) distributive property of addition over multiplication.
(c) associative property of addition.
(d) multiplicative inverse property.
(e) mysterious property of addition.

11. Two parallel lines are cut by a transversal as shown in the following figure. Find the value of x in degrees.



(a) 35°

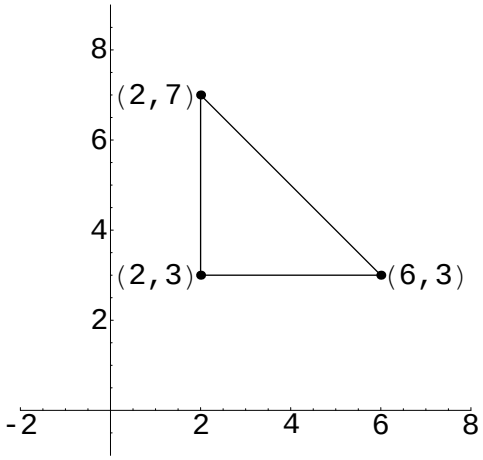
(b) 40°

(c) 70°

(d) 110°

(e) 180°

12. What is the length of the hypotenuse in the following right triangle?



(a) 2

(b) 4

(c) $2\sqrt{2}$

(d) $4\sqrt{2}$

(e) $2\sqrt{3}$

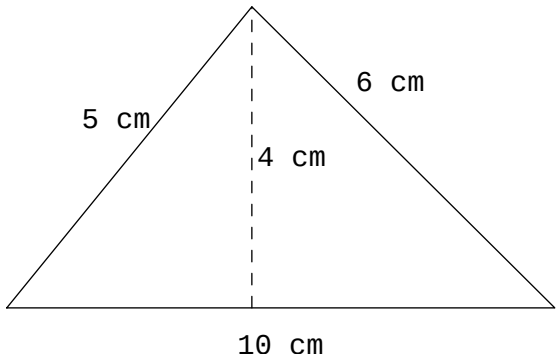
13. Find the smallest positive integer whose remainder is 1 when it is divided by 2, 3, 5, and 7.

    (a) 841
    (b) 631
    (c) 421
    (d) 211
    (e) 18

14. At Kennedy Middle School, 3 out of 5 students make honor roll. What is the probability that a student does not make honor roll?

    (a) 1
    (b) 4/5
    (c) 3/5
    (d) 2/5
    (e) 1/5

15. Find the area of the triangle shown in the following figure with base of length 10 cm, altitude with length 4 cm, and remaining sides with lengths 5 and 6 cm, respectively.



    (a) 24 cm^2
    (b) 50 cm^2
    (c) 60 cm^2
    (d) 40 cm^2
    (e) 20 cm^2

16. Alisha finds that she uses 15 gallons of gasoline for every 250 miles that she drives. Her friend Nicole averages the same miles per gallon. If Nicole travels 300 miles, how many gallons of gasoline will she need?

    (a) 16
    (b) 17
    (c) 18
    (d) 19
    (e) 20

17. If $P(x) = 3x + 3$ and $Q(x) = 4x^2 - 6x + 3$, find $P(-2) - Q(-1)$.

    (a) -16
    (b) -10
    (c) -8
    (d) 10
    (e) 16

18. If $f(x) = -x^2 + 2x$, then $f(x + h) =$

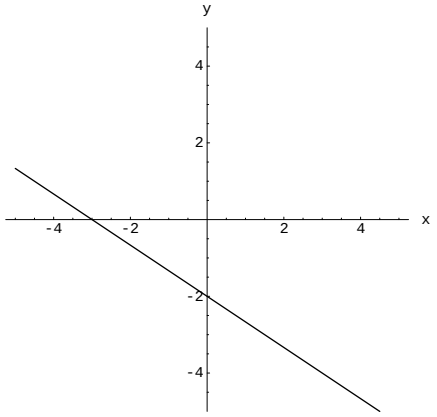
    (a) $-x^2 - 2xh - h^2 + 2x + 2h$
    (b) $-x^2 + 2x + h$
    (c) $-x^2 - h^2 + 2x + 2h$
    (d) $-x^2 + h^2 + 2x + 2h$
    (e) $-x^2 + 2xh + h^2 + 2x + 2h$

19. What will happen to the surface area of a cube if the length of the edges of the cube are doubled?

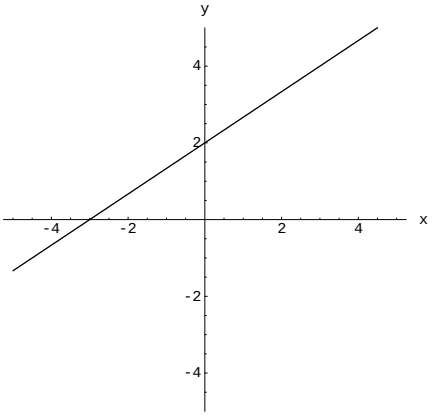
    (a) The surface area is multiplied by 1/2.
    (b) The surface area is multiplied by 2.
    (c) The surface area is multiplied by 4.
    (d) The surface area is multiplied by 8.
    (e) The surface area is multiplied by 16.

20. Of the following, which most closely represents the graph of the equation $2x + 3y + 6 = 0$?

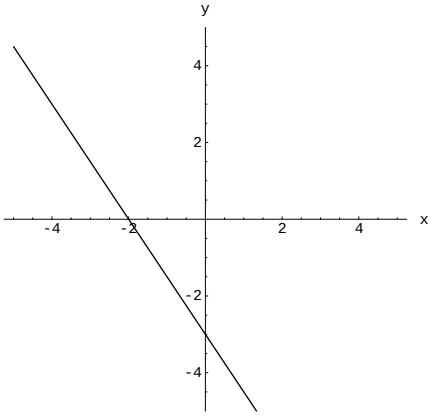
(a)



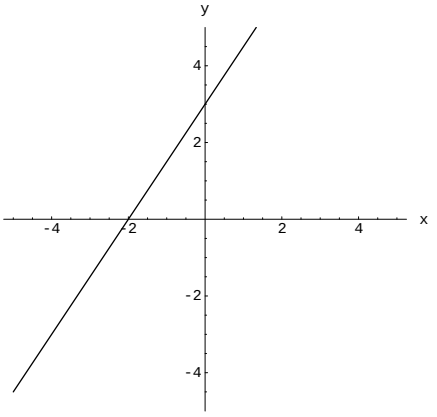
(b)



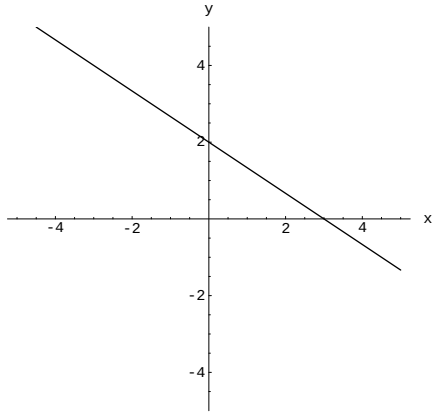
(c)



(d)



(e)



21. Find the slope of the line that passes through the point $(-2, 5)$ and is parallel to the line with equation $2x + 3y = 6$.

(a) $2/3$

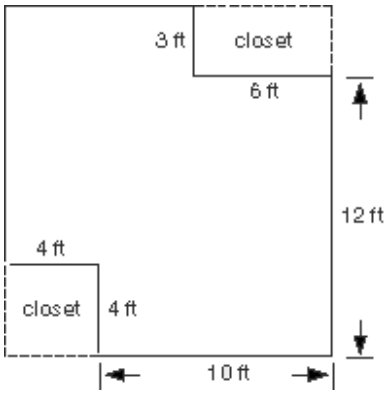
(b) $-2/3$

(c) $3/2$

(d) $-3/2$

(e) 2

22. Ada is selecting floor tiles for her room in her family's new house. No tiles will be put down in the closets. Each tile is 1 foot square and costs \$1.60. All the intersecting sides of the tiles meet at right angles.



How much will the tiles cost if there are no tiles left over?

(a) \$336.00
(b) \$288.00
(c) \$283.30
(d) \$281.60
(e) \$280.00

23. Simplify and express the answer as a reduced fraction:

$$\frac{3}{1+\dfrac{3}{1+\dfrac{3}{1+3}}}.$$

(a) 12/25
(b) 21/19
(c) 11/10
(d) 53/50
(e) 8

24. Simplify: $(3-5x)-4\left[2x+(x-7)\right]+(2x-6)$

(a) $-6x+1$
(b) $-10x-10$
(c) $-15x-31$
(d) $-15x+25$
(e) $9x+25$

25. A line that goes from one side of a circle to the other and passes through the center is called a

    (a) diameter.
    (b) chord.
    (c) radius.
    (d) tangent.
    (e) bird.

26. Rationalize the denominator of $\dfrac{1}{1-\sqrt{2}}$.

    (a) $-1-\sqrt{2}$
    (b) -1
    (c) $1-\sqrt{2}$
    (d) $1-\dfrac{1}{\sqrt{2}}$
    (e) $1+\sqrt{2}$

27. A box contains 4 red and 8 purple marbles. You pick out a marble with your left hand and do not look at it. Then you pick out a marble with your right hand and do not look at it. What is the probability that the marble in your left hand is red?

    (a) 1/4
    (b) 1/3
    (c) 1/2
    (d) 2/3
    (e) 3/4

28. Find the next number in the sequence

    3, 5, 8, 12, _____

    (a) 14
    (b) 15
    (c) 16
    (d) 17
    (e) 18

29. Simplify $(-4x^{-5}z^2)^{-3}$ and write the result without negative exponents.

(a) $-\dfrac{x^{15}}{64z^6}$

(b) $\dfrac{12}{x^8 z}$

(c) $\dfrac{12z^2}{x^5}$

(d) $-12x^5z^2$

(e) $\dfrac{64x^{15}}{z^6}$

30. 10^2 is how many times greater than 10^{-2}?

(a) 10000

(b) 1000

(c) 100

(d) 10

(e) 4

31. In a class of 30 students, there are 17 girls and 13 boys. A total of 5 students made an A grade on their report card, three of whom were girls. If a student from the class is chosen at random, what is the probability of getting a girl or an A student?

(a) 8/30

(b) 18/30

(c) 19/30

(d) 22/30

(e) 25/30

32. Solve the equation $4\,(2n - 3m) - 3\,(5n - 7m) = 0$ for n.

(a) $n = -\frac{33}{7}m$

(b) $n = -\frac{9}{7}m$

(c) $n = \frac{9}{7}m$

(d) $n = \frac{18}{7}m$

(e) $n = \frac{33}{7}m$

33. The height of a parallelogram is 6 more units than its base. What is the area of the parallelogram if the length of its base is 15 cm?

(a) $135\,\text{cm}^2$

(b) $189\,\text{cm}^2$

(c) $198\,\text{cm}^2$

(d) $315\,\text{cm}^2$

(e) $325\,\text{cm}^2$

34. Alice and Jessica are writing invitations for a surprise birthday party for their grandmother. Alice starts at 8:00 a.m. and writes 10 invitations per hour. Jessica starts at 10:00 a.m. and writes 15 invitations per hour. If the girls stop when they have written the same number of invitations, what time will it be?

(a) 5:00 p.m.

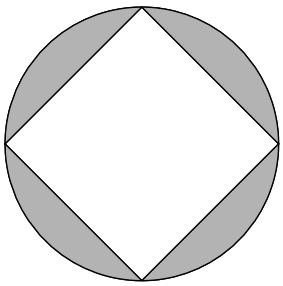
(b) 4:00 p.m.

(c) 3:00 p.m.

(d) 2:00 p.m.

(e) 1:00 p.m.

35. In the following figure, a square is inscribed in a circle. The area of the square is 49 square centimeters.



Using 22/7 as an approximation of π, find the area of the portion of the circle that is not inside the square.

(a) 18

(b) 28

(c) 38

(d) 48

(e) 58

36. Which of the following numbers is largest?

    (a) $\frac{1}{2}$

    (b) $\frac{3}{5}$

    (c) $\frac{2}{3}$

    (d) $\frac{1}{9}$

    (e) $\frac{3}{4}$

37. A picture that measures 12 cm by 18 cm is enlarged to a similar rectangle with its area four times that of the original. What are the new dimensions of the picture?

    (a) 6 cm by 9 cm

    (b) 16 cm by 22 cm

    (c) 24 cm by 36 cm

    (d) 48 cm by 72 cm

    (e) 144 cm by 324 cm

38. All the students in a school were weighed. Their average weight was 31.4 kilograms and their total weight was 18,337.6 kilograms. How many students are in the school?

    (a) 58

    (b) 60

    (c) 171

    (d) 584

    (e) 585

39. Solve $x\,(x-4) = 6$ for x.

    (a) $x = 6$ or $x = 10$

    (b) $x = 2 + 2\sqrt{2}i$ or $x = 2 - 2\sqrt{2}i$

    (c) $x = 2 + \sqrt{2}i$ or $x = 2 - \sqrt{2}i$

    (d) $x = 2 + 2\sqrt{10}$ or $x = 2 - 2\sqrt{10}$

    (e) $x = 2 + \sqrt{10}$ or $x = 2 - \sqrt{10}$

40. The circumference of the base of a right circular cylindrical can is 48 inches, and the height is 16 inches. A spiral stripe is painted on the can, winding around it exactly once as it reaches from bottom to top. It reaches the top exactly above the spot where it left the bottom.

    What is the length, in inches, of the stripe?

    (a) $16\sqrt{10}$

    (b) $4 + 4\sqrt{3}$

    (c) 48

    (d) 64

    (e) 768

Answers–2003 Junior High Written Exam

1. D
2. B
3. D
4. E
5. B
6. A
7. A
8. D
9. C
10. A
11. C
12. D
13. D
14. D
15. E
16. C
17. A
18. A
19. C
20. A
21. B
22. D
23. B
24. D
25. A
26. A
27. B
28. D
29. A
30. A
31. C
32. C
33. D
34. D
35. B
36. E
37. C
38. D
39. E
40. A