Need-To-Know Math - Please review before taking the Test

$A = \pi r^2$
$C = 2\pi r$

$A = \ell w$

$A = \frac{1}{2}bh$

$V = \ell wh$

$V = \pi r^2 h$

$c^2 = a^2 + b^2$

Special Right Triangles
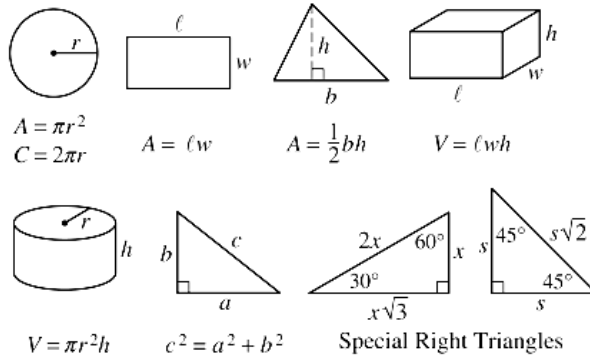
The number of degrees of arc in a circle is 360.
The sum of the measures in degrees of the angles of a triangle is 180.

1. Multiplication Tables. Know:
  -Full times tables through 12 * 12
  -15 times table through 15 * 10

Perfect Squares:

1 x 1 = 1
2 x 2 = 4
3 x 3 = 9
4 x 4 = 16
5 x 5 = 25
6 x 6 = 36
7 x 7 = 49
8 x 8 = 64
9 x 9 = 81
10 x 10 = 100
11 x 11 = 121
12 x 12 = 144
13 x 13 = 169
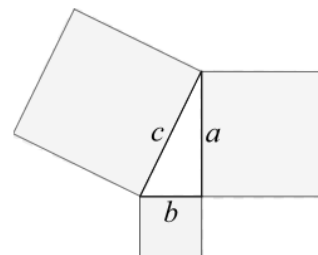14 x 14 = 196
15 x 15 = 225

20 x 20 = 400
25 x 25 = 625

15 Times Table (through 7) :
15 x 2 = 30
15 x 3 = 45
15 x 4 = 60
15 x 5 = 75
15 x 6 = 90
15 x 7 = 105

2. Exponent Rules (memorize):

$a^m * a^n = a^{(m+n)}$
$a^m/a^n = a^{(m-n)}$
$(a^m)^n = a^{(m*n)}$
$a^{-n} = 1/a^n$
$a^{(1/2)} = \sqrt{a}$
$(ab)^m = a^m * b^m$

3. Pythagorean Theorem
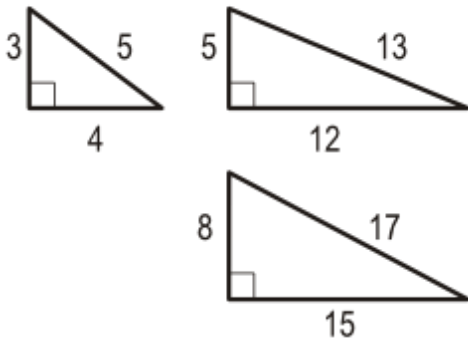

$a^2 + b^2 = c^2$
$c = \sqrt{a^2 + b^2}.$
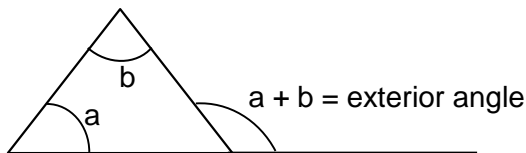
Pythagorean theorem

4. Perfect Right Triangles:
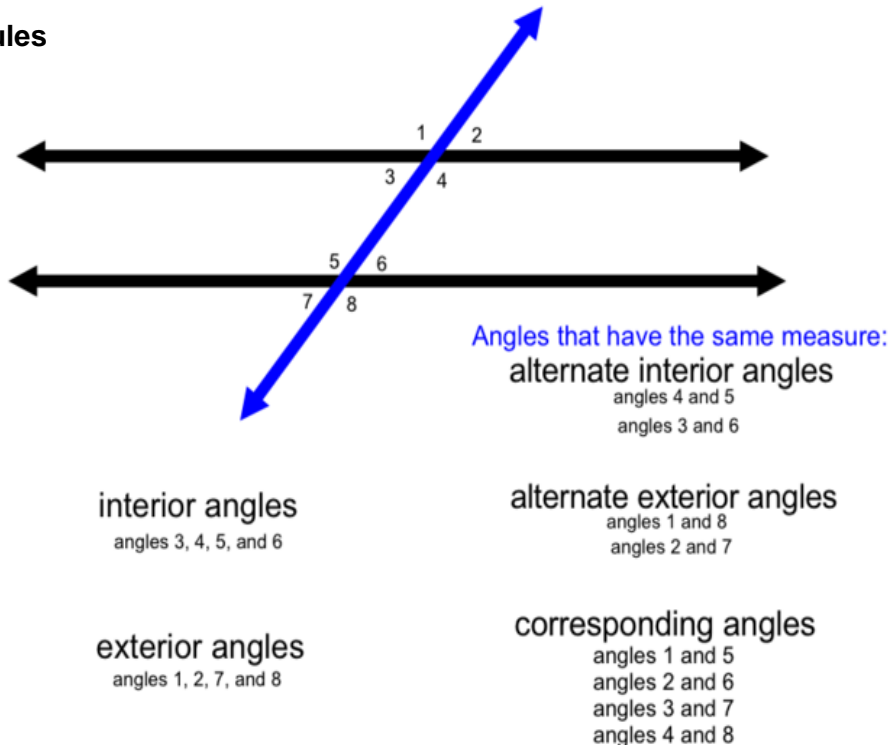
3, 4, 5 (and 6, 8, 10 – any 3x : 4x : 5x ratio works)
5, 12, 13
8, 15, 17

**5. An exterior angle of a triangle is equal to the
sum of the two non-adjacent interior angles of
the triangle.**

$a + b$ = exterior angle

6. Shaded area problems should always be done by subtraction:

(area of whole shape) – (area of un-shaded shape) = (area of shaded shape)

7. Angle Rules

Angles that have the same measure:
alternate interior angles
angles 4 and 5
angles 3 and 6

interior angles
angles 3, 4, 5, and 6

alternate exterior angles
angles 1 and 8
angles 2 and 7

exterior angles
angles 1, 2, 7, and 8

corresponding angles
angles 1 and 5
angles 2 and 6
angles 3 and 7
angles 4 and 8

8. Prime Numbers:
The number 1 is neither prime nor composite.
Number 2 is the only prime even number.
The prime numbers less than 50:
2, 3, 5, 7, 11, 13, 17, 19, 23, 29, 31, 37, 41, 43, 47

9. Definition of absolute value:
"the magnitude of a real number without regard to its sign". $|x| = \begin{cases} x \text{ if } x > 0 \\ -x \text{ if } x < 0 \end{cases}$

10. Similar Triangles:
Two triangles are similar if two angles of the triangle are equal or if all sides of one triangle are proportional to the sides of another triangle.
(cf. AA theorem, SSS theorem, and SAS theorem for similar triangles.)
The order of the angles matters. For example: 30-60-90 triangle ABC cannot be similar to both triangle DEF and triangle FED.

Instructions for Math Drill #3
25 Questions / 30 Minutes

- Solve each problem. Find the best answer among the answer choices given.
- You can do your figuring on the test or a separate sheet of paper, but **not** on the bubble answer sheet.
- Mark a "T" beside questions that eat up your time. Mark a "?" next to questions you guess on.
- Circle your answer choices on the test, then transfer your answers to the bubble answer sheet page by page as you progress through the test.
- There is no guessing penalty, so answer all questions.
- Don't get hung up on any one question… do a best guess and move on. Return to the problem later as time allows.

Important Notes:

1. Diagrams are not necessarily drawn to scale. Do not assume any relationship in a diagram unless it is specifically stated or can be figured out from the information given.
2. Assume that a diagram is in one plane unless the problem specifically states that it is not.
3. Reduce all fractions to lowest terms.

Symbols, Formulas, and Indicators

The following formulas and other reference information may be of use while solving the problems. You may refer to this information as needed during the test.

Symbols:

$\neq$	is not equal to
$<$	is less than
$>$	is greater than
$\leq$	is less than or equal to
$\geq$	is greater than or equal to
$//$	is parallel to
$\perp$	is perpendicular to

Indications:

Angles are indicated by ∠

Right angles are indicated by ∟

Formulas:

Circumference of a circle with radius r: $2\pi r$

Sum of the measures of the interior of a triangle = 180 degrees

Sum of the measure of the interior angle of a quadrilateral = 360 degrees

Area of a triangle with base, b, and height, h: $\frac{1}{2}bh$

Area of a parallelogram with base, b, and height, h: bh

Area of trapezoid with parallel sides a and b, and height h: $\frac{1}{2}(a+b)h$

Area of a circle with radius, r: πr^2

Mathematics Problems

Questions 1 -25

DIRECTIONS: Circle your answer choices on the test, then transfer your answers to the bubble answer sheet page by page as you progress through the test.

1. $1.5 \div \frac{3}{5} =$

   A. 2.5
   B. 0.9
   C. 4.5
   D. 9
   E. 25

2. Ben received 88 out of 100 on his fifth, and final, exam. He knows he received a 95, 92, and 85 on his last three tests. What did Ben score on his first exam that gave him a final average of 90?

   A. 80
   B. 85
   C. 87
   D. 90
   E. 95

3. In four years Brett will be twice as old as his brother. If Brett is currently 8 years old, how old is his brother?

   A. 2 years
   B. 4 years
   C. 6 years
   D. 8 years
   E. 12 years

4. Three trees are measured with an average height of 15 feet. The first two trees are 18 feet tall. What is the height of the third tree?

   A. 9 ft.
   B. 10 ft.
   C. 11 ft.
   D. 12 ft.
   E. 13 ft.

5. A 60 ft. seam is being sealed with tape. Four, 5 ft. lengths are placed end to end from the beginning of the seam. Two more, equally-sized, lengths of tape are used to complete the seal. How long are the longer strips?

   A. 8 ft.
   B. 10 ft.
   C. 15 ft.
   D. 20 ft.
   E. 40 ft.

6. A mom, dad and their three children are sitting at their dining room table. The table is rectangular and only the mom or dad can sit at the head of the table but the kids and the other parent can sit at the other four seats at the table. How many different ways can the five people sit at the table?

    A. 120
   **B.** 60
    C. 48
    D. 24
    E. 10

7. Four people are in a contest: Anne, Bob, Cal and Dan. There are two identical prizes and everybody has an equal chance of winning a prize. What is the probability that both Anne and Bob will win the two prizes?

    A. 1/2
    B. 1/3
    C. 1/4
    D. 1/5
    E. 1/6

8. If I'm driving to Harrisonburg which is 120 miles away. How fast do I have to drive on average to get to Harrisonburg in three hours?

    A. 80 mph
    B. 70 mph
    C. 60 mph
    D. 50 mph
    E. 40 mph

9.
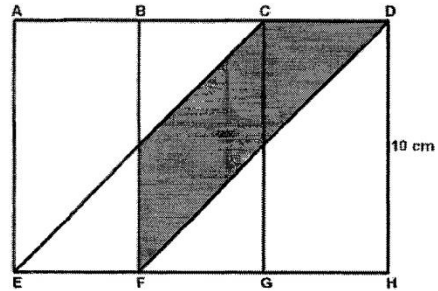
$ACGE$ and $BDHF$ are both squares. $\overline{EFGH}$ is a straight segment. $\overline{CE}$ bisects $\overline{BF}$ and $\overline{DF}$ bisects $\overline{CG}$. What is the area of the shaded region?

    A. 20.5 sq. cm.
    B. 25 sq. cm.
    C. 30.5 sq. cm.
    D. 37.5 sq. cm
    E. 50 sq. cm.

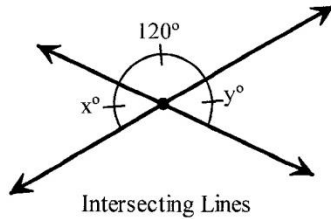**10.** A rectangular field is 5 times as long as it is wide. The field is 12 meters wide. What is the field's area?

    A. 60 m^2
    B. 240 m^2
    C. 560 m^2
    D. 600 m^2
    E. 720 m^2

11. How much is added to the value 0.0999 to raise it to the nearest tenth?

    A. 0.00001
    B. 0.0001
    C. 0.0011
    D. 0.001
    E. 0.1

12.

Intersecting Lines

Based on the figure of intersecting lines, what is the value of y?

- **A.** $40°$
- **B.** $60°$
- **C.** $90°$
- **D.** $120°$
- **E.** $180°$

13. When x is divided by 3 the remainder is 2. What is the remainder when $x + 3$ is divided by 3?

- **A.** 0
- **B.** 1
- **C.** 2
- **D.** 3
- **E.** 4

14. A 10-sided polygon has 2 sides at x meters. Five sides are $3x$, two sides are $4x$, and the last side is 5 meters. The perimeter is 80 meters. What is x?

- **A.** 2.5 m
- **B.** 3 m
- **C.** 4 m
- **D.** 4.5 m
- **E.** 5.5 m

15. What is the value of $(x + y)(x - y)$ given $x = 12, y = 8$.

- **A.** 40
- **B.** 80
- **C.** 800
- **D.** 400
- **E.** 60

16. What is the greatest prime factor of 280?

- **A.** 2
- **B.** 5
- **C.** 7
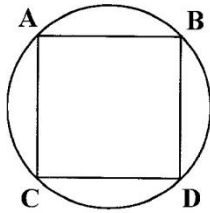- **D.** 11
- **E.** 28

17. $4x(2y + 3) =$

- **A.** $8xy + 12x + 1$
- **B.** $8xy + 12x$
- **C.** $8xy + 1$
- **D.** $6xy + 12x$
- **E.** $2y + 12x$

18. B is 10% of C, and C is 20% of 100. What is the value of B.

- **A.** 1
- **B.** 2
- **C.** 10
- **D.** 20
- **E.** 100

19.

The figure above depicts the square $\overline{ABCD}$ which is tangent to the circle at each corner. If the diagonal of the square is 9 millimeters long, what is the circumference of the circle?

A. 3π mm
B. 9π mm
C. 18π mm
D. 81π mm
E. $81\pi^2$ mm

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20. If the numeral 12,435,389.34 is multiplied by 1000, what number would be in the **thousands** place?

A. 9
B. 8
C. 3
D. 4
E. 5

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21. A battery charger can charge **four** AA batteries during one session. Each charging session lasts exactly 1.5 hours. If 14 batteries need to be charged, what is the minimum amount of time needed to charge all the batteries?
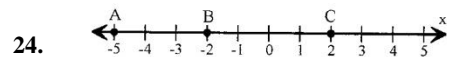
A. 2 hours
B. 3 hours
C. 4 hours
D. 5 hours
E. 6 hours

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22. Given $\frac{5(x-2)}{15} = 1$, what is the value of x?

A. 1
B. 3
C. 5
D. 8
E. 9

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23. Given the number set: [8, 14, 67, 81, 96, 96, 104], what is the median?

A. 14
B. 8
C. 96
D. 81
E. 67

24.

What is the sum of the lengths $\overline{AB}$ to $\overline{BC}$?

A. 10
B. 9
C. 5
D. 6
E. 7

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25. If $f < 0$ and $g > 0$, which expression **must** be negative?

A. $f^2 - g$
B. $f \div g$
C. $g + f$
D. $f^2 - g^2$
E. $g - f$

THIS IS THE END OF THE TEST. ANSWER KEY IS ON THE NEXT PAGE.

INSPIRING Test Preparation

Answer Sheet

COMPLETE MARK ●	EXAMPLES OF INCOMPLETE MARKS	You must use a No. 2 pencil and marks must be complete. Do not use a mechanical pencil. It is very important that you fill in the entire circle darkly and completely. If you change your response, erase as completely as possible. Incomplete marks or erasures may affect your score.

1	Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ	11	Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ	21	Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ
2	Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ	12	Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ	22	Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ
3	Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ	13	Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ	23	Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ
4	Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ	14	Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ	24	Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ
5	Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ	15	Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ	25	Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ
6	Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ	16	Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ		
7	Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ	17	Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ		
8	Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ	18	Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ		
9	Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ	19	Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ		
10	Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ	20	Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ		

ANSWERS – Drill #3

1- A
2- D
3- A
4- A
5- D
6- C
7- E
8- E
9- D
10- E
11- B
12- B
13- C
14- B
15- B
16- C
17- B
18- B
19- B
20- A
21- E
22- C
23- D
24- E
25- B