

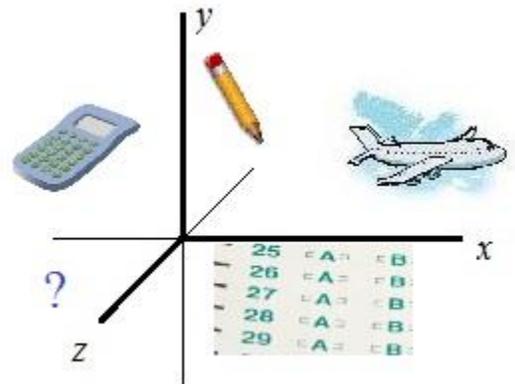
# SAT MATH –

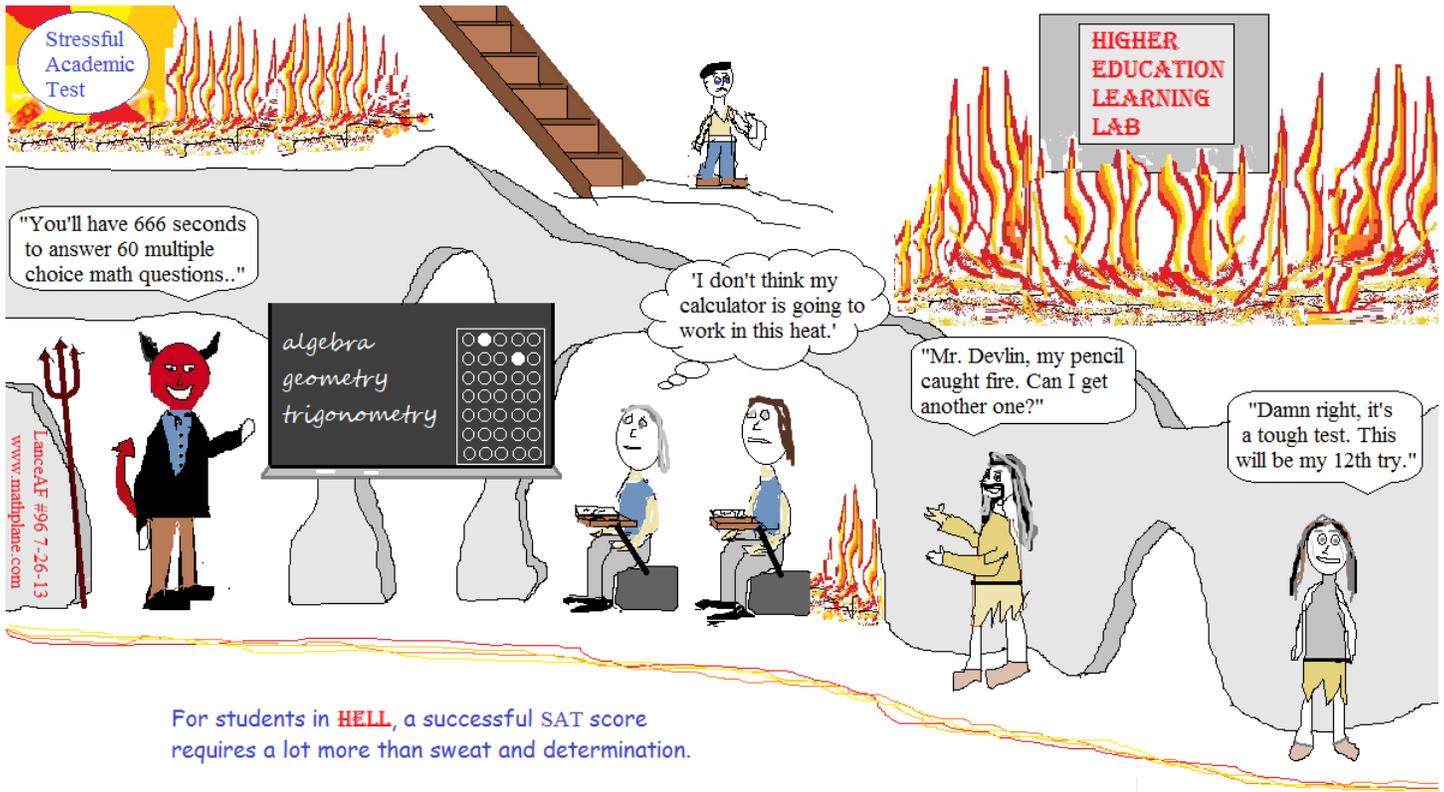
## SUBJECT LEVEL 2

### TOPICS TO KNOW

A list of suggested concepts from Algebra, Geometry, Trigonometry, Pre-Calculus, and Statistics

*Presented with sample questions (and solutions)*





## Warm-up: SAT Basic Topics to Know

SAT Topics to Know

1) Which of the following is NOT true:

Classifying Numbers

- a) The set of integers is larger than the set of natural numbers
- b) All integers are real numbers
- c)  $\sqrt[3]{3}$  is irrational
- d) A repeating decimal, such as .292929... is irrational
- e) There are an infinite number of rational numbers between 10 and 20

2)  $3 \cdot 4^2 - \frac{(9-3)}{2} \cdot 4 =$

PEMDAS/Order of Operations

- a) 12
- b) 36
- c) 156
- d) 164
- e) 180

3) How many prime factors of 60 are there?

Prime factorization

- a) 1
- b) 2
- c) 3
- d) 4
- e) 5

4) Find the greatest common factor and least common multiple of 10 and 25.

GCF and LCM

- a) LCM: 10 GCF: 25
- b) LCM: 50 GCF: 5
- c) LCM: 250 GCF: 50
- d) LCM: 1 GCF: 250
- e) LCM: 10 GCF: 5

5) What is the next term in this *geometric* sequence:  $1/2, 1/4$  ?

Sequences

- a)  $1/6$
- b)  $1/8$
- c) 0
- d)  $1/16$
- e) 4

6) What percent of 20 is 15?

Percentages

- a) 3
- b) 30
- c) 75
- d) 133
- e) 300

7) What is the median of set A?  $A = \{5, 0, -7, 8, -3, 8, 3\}$

Mean, Median, Mode, and Range

- a) 5
- b) -7
- c) 8
- d) 3
- e) 2

8) A bag contains 20 marbles: 4 blue, 7 white, and 9 red.  
What is the probability of picking 2 white marbles (without replacement)?

Probability

- a)  $13/20$
- b)  $21/190$
- c)  $49/400$
- d)  $21/200$
- e)  $9/19$

9) A diner serves lunch with the following number of choices:

3 beverages

4 entrees

5 sides

How many different meals could you order  
having 1 beverage, 1 entree, and 2 different sides?

Counting Principles  
(combinations/permutations)

- a) 12
- b) 16
- c) 60
- d) 240
- e) 300

10)  $(3x^2y^3)^2 =$

Exponents

- a)  $3x^4y^5$
- b)  $3x^4y^6$
- c)  $9x^4y^5$
- d)  $9x^4y^6$
- e)  $9xy^{10}$

11)  $(x + 1)$  is a factor of  $2x^2 - 8x - 10$ . What is the other binomial factor? Factoring

- a) 2
- b)  $2x - 5$
- c)  $x + 10$
- d)  $x - 5$
- e)  $2x - 8$

12)  $(2x - 7)^2 =$  FOIL

- a)  $4x + 49$
- b)  $4x^2 + 49$
- c)  $4x^2 + 14x + 49$
- d)  $4x^2 - 28x + 49$
- e)  $4x^2 - 49$

13)  $f(x) = 2x - 7$     $g(x) = x^2$  Function notation

$$f(g(-3)) =$$

- a) -26
- b) -19
- c) -13
- d) 11
- e) 139

14)  $y = 3|x - 5| + 2$  Absolute Value

If the output  $y = 8$ , then what is  $x$  ?

- a) 7
- b) 11
- c) 3, 7
- d) 18
- e) 8

15) What is the y-intercept for the parabola  $y = (x - 6)^2 + 3$  ? Parabolas

- a) (0, -6)
- b) (0, 3)
- c) (0, 6)
- d) (0, 36)
- e) (0, 39)

16) What is the slope of a line parallel to  $2x + 3y = 12$  ?

Linear equations

- a) 2
- b) -2
- c)  $-2/3$
- d)  $3/2$
- e) 4

17) A circle's diameter has endpoints at (3, 4) and (8, -1). What is the length of the diameter?

Distance formula

- a) 10
- b)  $5\sqrt{2}$
- c) 8
- d)  $\sqrt{34}$
- e) 5

18) The midpoint (M) of line segment  $\overline{AB}$  is (1, 6).  
If point A is (-3, 14), what is the coordinate of point B?

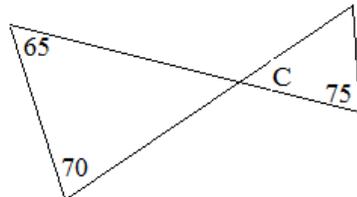
Midpoint formula

- a) (-1, 10)
- b) (5, -2)
- c) (-7, 22)
- d) (-2, 20)
- e) (3, 7)

19) What is the measure of angle C ?

Triangles and Intersecting lines

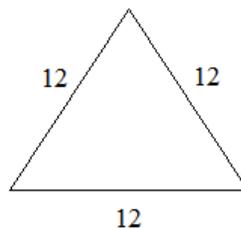
- a) 45
- b) 65
- c) 75
- d) 135
- e) 140



20) What is the altitude (height) of the equilateral triangle?

Triangles, Pythagorean Theorem, and special right triangles

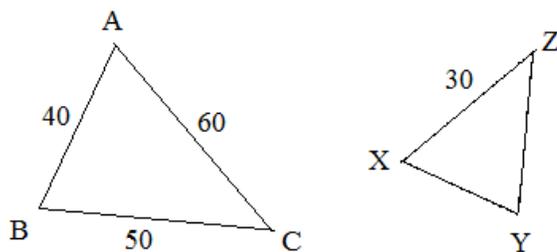
- a) 12
- b) 15
- c) 6
- d)  $6\sqrt{3}$
- e)  $12\sqrt{2}$



21)  $\triangle ABC \sim \triangle XYZ$

What is measure of  $\overline{YZ}$  ?

- a) 20
- b) 25
- c) 35
- d) 45
- e) 80

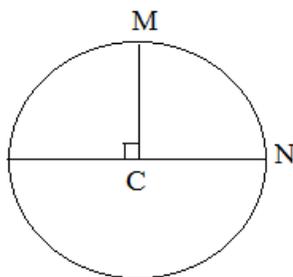


Ratios and Similarity

22) What is the arc length of  $\widehat{MN}$  ?

$\overline{MC} = 6$

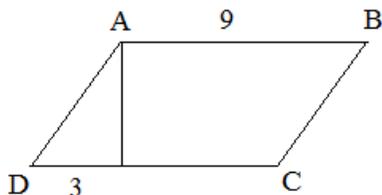
- a)  $3\pi$
- b)  $6\pi$
- c)  $9\pi$
- d)  $12\pi$
- e)  $36\pi$



Circles, Arc Length, and Sector Area

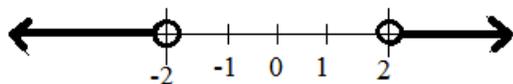
23) If the perimeter of ABCD is 28, what is the area?

- a) 20
- b) 27
- c) 36
- d) 45
- e) 63



Polygons: perimeter and area

24) Describe the number line inequality:



- a)  $x > 2$  and  $x < -2$
- b)  $x > 2$  or  $x < -2$
- c)  $x \geq 2$  and  $x \leq -2$
- d)  $x \geq 2$  or  $x \leq -2$
- e)  $-2 < x < 2$

Inequalities

Study Break:  
Math Snacks

LanceAF #35 6-3-12  
[www.mathplane.com](http://www.mathplane.com)



*Preferable to ordinary computer cookies...*

*Essential part of a well-rounded, academic diet.*

*Try with (t), or any beverage...*

*Also, look for Honey Graham Squares  
in the geometry section of your local store...*

## More Advanced Topics: Level 2

SAT Subject Test -- Math Level 2 Topics to Know

1) If  $f(x) = \frac{2x + 5}{2 - 5x}$  what value does  $f(x)$  approach as  $x$  gets infinitely larger?

Limits and Asymptotes

- a)  $-2/5$
- b)  $0$
- c)  $2/5$
- d)  $1$
- e)  $5/2$

2) In a standard coordinate plane, the equation  $(x + 3)^2 + (y - 4)^2 = 100$  is a circle. What is the distance from the center of the circle to the origin?

Coordinate Geometry  
(Distance & Midpoint)

- a)  $\sqrt{7}$
- b)  $\sqrt{12}$
- c)  $5$
- d)  $7$
- e)  $10$

3) Two dice are rolled. What is the probability that their sum is less than 4?

Probability

- a)  $1/3$
- b)  $1/4$
- c)  $1/6$
- d)  $1/12$
- e)  $1/18$

4) The lines  $2x + 3y = 12$  and  $-2x - Ky = 6$  are perpendicular for what value of  $K$ ?

Linear systems

- a)  $-4/3$
- b)  $-3/2$
- c)  $-1/2$
- d)  $1/2$
- e)  $3/2$

5) The range of  $y = -|x + 2| + 5$

Domain & Range  
of Functions

- a)  $y \leq -2$
- b)  $y \leq 2$
- c)  $y \leq 5$
- d)  $y \geq 2$
- e)  $y \geq 5$

SAT Subject Test -- Math Level 2 Topics to Know

6)  $f(x) = -2x^2$  is translated 3 units to the right and 1 unit up.  
If the resulting graph is  $g(x)$ , then what is  $g(-1)$ ?

Functions, translation, and transformation

- a) -31
- b) -24
- c) -7
- d) -4
- e) 0

7) A sequence is (recursively) defined as  $a_1 = 0$                       What is  $a_6$  ?

Sequences and Series

- a) 6     $a_2 = 1$
- b) 11    and, for  $n > 2$
- c) 20     $a_n = a_{n-1} + 6a_{n-2}$
- d) 31
- e) 55

8) The table shows the number of math books sold during the last 3 days.  
The prices of geometry, algebra, and trigonometry are \$57, \$47 and \$74 respectively.  
Which of the following matrices gives the total revenue, in dollars, from the books for each of the last 3 days?

Matrices and Tables

	saturday	sunday	monday
geometry	28	7	40
algebra	20	11	27
trigonometry	7	4	30

a)  $\begin{bmatrix} 28 & 7 & 40 \\ 20 & 11 & 27 \\ 7 & 4 & 30 \end{bmatrix} \begin{bmatrix} 57 & 47 & 74 \end{bmatrix}$

b)  $\begin{bmatrix} 57 & 47 & 74 \end{bmatrix} \begin{bmatrix} 28 & 7 & 40 \\ 20 & 11 & 27 \\ 7 & 4 & 30 \end{bmatrix}$

c)  $\begin{bmatrix} 57 \\ 47 \\ 74 \end{bmatrix} \begin{bmatrix} 28 & 7 & 40 \\ 20 & 11 & 27 \\ 7 & 4 & 30 \end{bmatrix}$

d)  $\begin{bmatrix} 28 & 7 & 40 \\ 20 & 11 & 27 \\ 7 & 4 & 30 \end{bmatrix} \begin{bmatrix} 57 \\ 47 \\ 74 \end{bmatrix}$

e)  $57 \begin{bmatrix} 28 & 7 & 40 \\ 20 & 11 & 27 \\ 7 & 4 & 30 \end{bmatrix} + 47 \begin{bmatrix} 28 & 7 & 40 \\ 20 & 11 & 27 \\ 7 & 4 & 30 \end{bmatrix} + 74 \begin{bmatrix} 28 & 7 & 40 \\ 20 & 11 & 27 \\ 7 & 4 & 30 \end{bmatrix}$

9) If integers  $n > 3$  and  $p > 3$ , how many pairs  $(n, p)$  satisfy the inequality  $2n + 2p < 20$  ?

Miscellaneous, logic, numbers, arithmetic

- a) 3
- b) 4
- c) 5
- d) 6
- e) 7

SAT Subject Test -- Math Level 2 Topics to Know

10) If  $\sin x = -\frac{1}{2}$  and  $\tan x > 0$ , then  $x =$

Trigonometry

- a)  $-\frac{\pi}{6}$
- b)  $\frac{\pi}{6}$
- c)  $\frac{5\pi}{6}$
- d)  $\frac{7\pi}{6}$
- e)  $\frac{11\pi}{6}$

11) The point  $(2, -1, 0)$  lies on the

3-Dimension Coordinate Space

- a) y-axis
- b) z-axis
- c) xy-plane
- d) xz-plane
- e) yz-plane

12) If  $ax^3 + bx^2 + c$  is divided by  $(x - 3)$ , then the remainder is:

Polynomial Roots and Theorems

- a)  $-27a + 9b + c$
- b)  $-27a - 9b$
- c)  $27a + 9b + c$
- d)  $27a + 9b$
- e)  $-27a + 9b$

13) What are the polar coordinates of a point with  $(-3, 3)$  rectangle coordinates?

Polar coordinates

- a)  $(3, 135^\circ)$
- b)  $(-3, 135^\circ)$
- c)  $(3\sqrt{2}, 45^\circ)$
- d)  $(3\sqrt{2}, 135^\circ)$
- e)  $(-3\sqrt{2}, 45^\circ)$

14) Let  $\log(x) = 3$  and  $\log(y) = 5$ ; Find  $\log(x^2 y)$

Logarithms

- a) 11
- b) 14
- c) 15
- d) 28
- e) 45

SAT Subject Test -- Math Level 2 Topics to Know

15) Find  $(5 + 2i)(5 - 2i)$   $i^2 = -1$

Complex Numbers

- a)  $25 - 4i$
- b)  $25 - 20i$
- c) 21
- d) 29
- e) 0

16) The length of the major axis in the ellipse  $4(x + 5)^2 + 9y^2 = 36$  is

Conics

- a) 3
- b) 4
- c) 5
- d) 6
- e) 9

17)  $\cos 2x + \cos x = 0$  On the interval  $[0, 2\pi)$ ,  $x =$

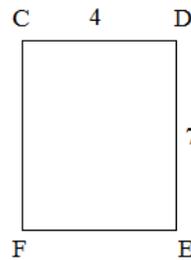
Trig Identities

- a)  $\pi$
- b)  $\frac{\pi}{2}, \frac{3\pi}{2}$
- c)  $\frac{\pi}{3}, \pi, \frac{5\pi}{3}$
- d)  $\frac{2\pi}{3}, \frac{4\pi}{3}$
- e)  $\frac{2\pi}{3}, \pi, \frac{4\pi}{3}$

18) If rectangle CDEF is rotated about side DE, it creates a cylinder of volume:

Area and Volume (Cylinders, Prisms, Pyramids, etc.)

- a)  $28\pi$
- b)  $56\pi$
- c)  $98\pi$
- d)  $112\pi$
- e)  $196\pi$



SAT Subject Test -- Math Level 2 Topics to Know

19) Tom can paint a fence in 5 hours. Huck can paint a fence in 8 hours. If they work together, how long would it take for them to paint *three* fences?

Word Problems

- a) 3 hours 5 minutes
- b) 6 hours 30 minutes
- c) 9 hours 14 minutes
- d) 10 hours 20 minutes
- e) 11 hours 42 minutes

20)  $u = \langle 3, -2 \rangle$   $v = \langle 4, 1 \rangle$  The magnitude of  $u + v$  is

Vectors

- a) 6
- b) 10
- c)  $5\sqrt{2}$
- d)  $4\sqrt{3}$
- e)  $\langle 7, -1 \rangle$

21) A line has the parametric equation  $x = t + 5$  and  $y = t + 10$ . What is the slope of the line?

Parametric Equations

- a) 1
- b) 2
- c) 5
- d) 10
- e) 50

22) The 4th term in the binomial expansion  $(m - p)^7$  is

Binomial Expansion

- a)  $4mp$
- b)  $35mp$
- c)  $35m^4 p^3$
- d)  $-35m^4 p^3$
- e)  $-70m^4 p^3$

Teaching an Old  
Dog new Tricks

Diophantus,  
Oka, &  
Gauss  
School of Mathematics

Grades K-9



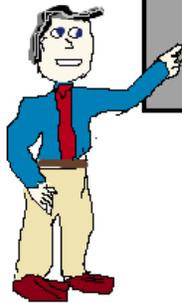
Restrooms

Teachers

Students

"Notice how I convert the  
answer into 'your' years."

$$12 \text{ HYR} \times \frac{7 \text{ dYR}}{1 \text{ HYR}} = 84 \text{ dYR}$$



My age is 84.



# SOLUTIONS

1) Which of the following is NOT true:

Classifying Numbers

- a) The set of integers is larger than the set of natural numbers
- b) All integers are real numbers
- c)  $\sqrt[3]{3}$  is irrational
- d) A repeating decimal, such as .292929... is irrational**
- e) There are an infinite number of rational numbers between 10 and 20

$$.2929... = \frac{29}{99}$$

any number that can be expressed as a fraction is *rational*

$$2) \quad 3 \cdot 4^2 - \frac{(9-3)}{2} \cdot 4 = \quad 3 \cdot 16 - \frac{6}{2} \cdot 4$$

PEMDAS/Order of Operations

- a) 12
- b) 36**
- c) 156
- d) 164
- e) 180

order of operations: parentheses  
exponents  
multiplication/  
division  
addition/  
subtraction

$$48 - 3 \cdot 4$$

$$48 - 12 = 36$$

3) How many prime factors of 60 are there?

Prime factorization

- a) 1
- b) 2
- c) 3**
- d) 4
- e) 5

factors of 60: 1 and 60  
2 and 30  
3 and 20  
4 and 15  
5 and 12  
6 and 10

of those, 2, 3, and 5 are prime..

4) Find the greatest common factor and least common multiple of 10 and 25.

GCF and LCM

a) LCM: 10 GCF: 25

Factors:

Multiples:

**b) LCM: 50 GCF: 5**

10: 1, 2, 5, 10

10: 10, 20, 30, 40, 50, 60, ...

c) LCM: 250 GCF: 50

25: 1, 5, 25

25: 25, 50, 75, 100, ...

d) LCM: 1 GCF: 250

common factors are 1 and 5

common multiples include 50, 100, 150

e) LCM: 10 GCF: 5

GCF: 5

LCM: 50

5) What is the next term in this *geometric* sequence: 1/2, 1/4 ?

Sequences

a) 1/6

The common ratio of the sequence is 1/2.. So, the next term is  $1/4 \cdot 1/2 = 1/8$

**b) 1/8**

c) 0

geometric sequence: 1/2, 1/4, 1/8, 1/16...

d) 1/16

arithmetic sequence would be adding -1/4...

e) 4

1/2, 1/4, 0, -1/4, -1/2, -3/4, ...

6) What percent of 20 is 15?

Percentages

a) 3

$$\frac{X}{100} = \frac{15}{20}$$

b) 30

c) 75

$$\frac{X}{100} = \frac{3}{4} \quad X = 75$$

d) 133

e) 300

7) What is the median of set A?  $A = \{5, 0, -7, 8, -3, 8, 3\}$

Mean, Median, Mode, and Range

a) 5

median is the middle value:

$$\text{mean is the 'average'} = \frac{\text{total of set}}{\# \text{ of items}} = \frac{14}{7} = 2$$

b) -7

c) 8

set A is order: -7, -3, 0, 3, 5, 8, 8

mode is 'most often' = 8

d) 3

the middle term is 3

range is amount between high and low: -7 to 8 is 15

e) 2

8) A bag contains 20 marbles: 4 blue, 7 white, and 9 red.

Probability

What is the probability of picking 2 white marbles (without replacement)?

a) 13/20

b) 21/190

$$p(\text{drawing first white marble}) = \frac{7}{20}$$

c) 49/400

$$p(\text{drawing second white marble} | \text{the first was white}) = \frac{6}{19}$$

d) 21/200

$$\frac{7}{20} \cdot \frac{6}{19} = \frac{21}{190}$$

e) 9/19

9) A diner serves lunch with the following number of choices:

Counting Principles

3 beverages

(combinations/permutations)

4 entrees

How many different meals could you order

5 sides

having 1 beverage, 1 entree, and 2 different sides?

a) 12

b) 16

1 beverage: 3 choices

c) 60

1 entree: 4 choices

d) 240

first side: 5 choices

$$\text{number of choices: } 3 \times 4 \times 5 \times 4 = 240$$

e) 300

second side: 4 remaining choices

10)  $(3x^2y^3)^2 =$

Exponents

$$3x^2y^3 \cdot 3x^2y^3 = 9x^4y^6$$

a)  $3x^4y^5$

b)  $3x^4y^6$

c)  $9x^4y^5$

d)  $9x^4y^6$

e)  $9xy^{10}$



16) What is the slope of a line parallel to  $2x + 3y = 12$  ?

Linear equations

- a) 2
- b) -2
- c)  $-2/3$
- d)  $3/2$
- e) 4

(parallel lines have the same slope; perpendicular lines have slopes with opposite reciprocals)

$$\begin{aligned} 2x + 3y &= 12 \\ 3y &= -2x + 12 \\ y &= \frac{-2x}{3} + 4 \end{aligned}$$

17) A circle's diameter has endpoints at (3, 4) and (8, -1). What is the length of the diameter?

Distance formula

- a) 10
- b)  $5\sqrt{2}$
- c) 8
- d)  $\sqrt{34}$
- e) 5

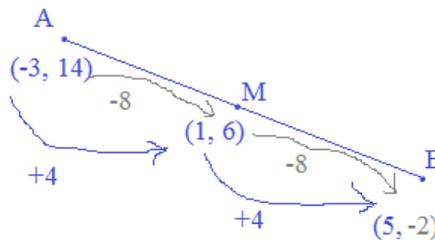
distance formula:  $d = \sqrt{(x_1 - x_2)^2 + (y_1 - y_2)^2}$

$$\sqrt{(3 - 8)^2 + (4 - (-1))^2} = \sqrt{25 + 25} = 5\sqrt{2}$$

18) The midpoint (M) of line segment  $\overline{AB}$  is (1, 6). If point A is (-3, 14), what is the coordinate of point B?

Midpoint formula

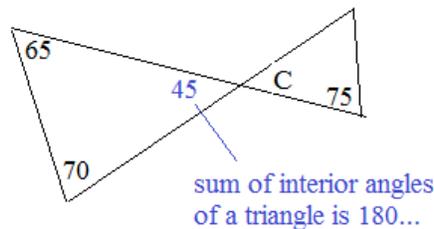
- a) (-1, 10)
- b) (5, -2)
- c) (-7, 22)
- d) (-2, 20)
- e) (3, 7)



19) What is the measure of angle C ?

Triangles and Intersecting lines

- a) 45
- b) 65
- c) 75
- d) 135
- e) 140



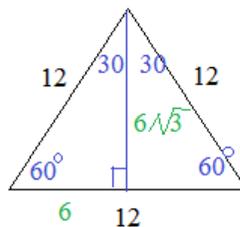
then, C is 45  
(vertical angles are congruent)

20) What is the altitude (height) of the equilateral triangle?

Triangles, Pythagorean Theorem, and special right triangles

- a) 12
- b) 15
- c) 6
- d)  $6\sqrt{3}$
- e)  $12\sqrt{2}$

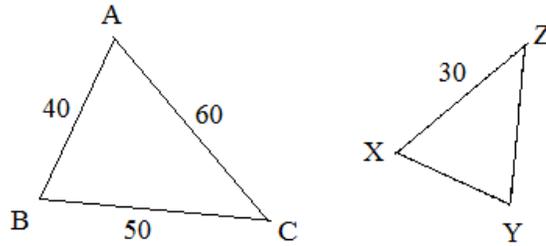
30-60-90 right triangle:



21)  $\triangle ABC \sim \triangle XYZ$

What is measure of  $\overline{YZ}$  ?

- a) 20
- b) 25**
- c) 35
- d) 45
- e) 80



Ratios and Similarity

$$\text{ratio: } \frac{AC}{XZ} = \frac{60}{30} = \frac{2}{1}$$

$$\text{so, } \frac{BC}{YZ} = \frac{2}{1} \quad YZ = 25$$

22) What is the arc length of  $\widehat{MN}$  ?

$$\overline{MC} = 6$$

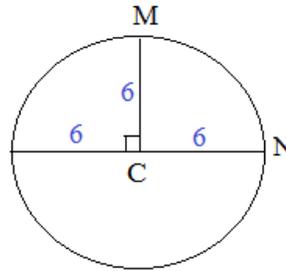
- a)  $3\pi$**
- b)  $6\pi$
- c)  $9\pi$
- d)  $12\pi$
- e)  $36\pi$

circumference of circle:

$$\pi(\text{diameter}) = 12\pi$$

Since  $MN$  is  $1/4$  of the entire circle, the arc length is  $1/4$  of the circumference:

$$3\pi$$



Circles, Arc Length, and Sector Area

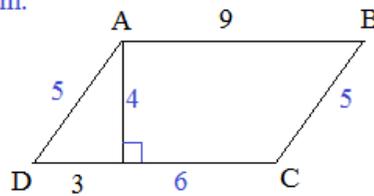
23) If the perimeter of ABCD is 28, what is the area?

- a) 20
- b) 27
- c) 36**
- d) 45
- e) 63

Area of parallelogram:

$$(\text{base})(\text{height}) =$$

$$9 \times 4 = 36$$



Polygons: perimeter and area

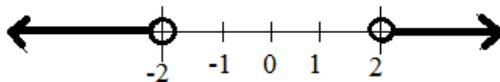
$$\overline{AB} = \overline{DC} \text{ so, } \overline{DC} = 9$$

Since the perimeter is 28, and the horizontal sides add to 18, then, the vertical sides are each 5

Then, recognizing the 3-4-5 right triangle, gets the height..

24) Describe the number line inequality:

Inequalities



- a)  $x > 2$  and  $x < -2$
- b)  $x > 2$  or  $x < -2$**
- c)  $x \geq 2$  and  $x \leq -2$
- d)  $x \geq 2$  or  $x \leq -2$
- e)  $-2 < x < 2$

If the circles were "closed", the inequalities would be  $\leq$  and  $\geq$

If the region *between* the points were shaded, the inequality would be "AND"

1) If  $f(x) = \frac{2x + 5}{2 - 5x}$  what value does  $f(x)$  approach as  $x$  gets infinitely larger?

Limits and Asymptotes

a)  $-2/5$

b) 0

c)  $2/5$

d) 1

e)  $5/2$

rewrite the function:  $\frac{2x + 5}{-5x + 2}$

since degree of numerator is the same as degree of the denominator, use the lead coefficients...

$$\frac{2}{-5}$$

2) In a standard coordinate plane, the equation  $(x + 3)^2 + (y - 4)^2 = 100$  is a circle.

Coordinate Geometry  
(Distance & Midpoint)

What is the distance from the center of the circle to the origin?

a)  $\sqrt{7}$

b)  $\sqrt{12}$

c) 5

d) 7

e) 10

The center of the circle is  $(-3, 4)$

The distance to the origin is  $\sqrt{(-3 - 0)^2 + (4 - 0)^2} = 5$

3) Two dice are rolled. What is the probability that their sum is less than 4?

Probability

a)  $1/3$

b)  $1/4$

c)  $1/6$

d)  $1/12$

e)  $1/18$

Total possible ways to roll 2 dice:  $6 \times 6 = 36$

Number of outcomes less than 4: 3 (1|1 1|2 or 2|1)

$$\text{probability} = \frac{3}{36}$$

4) The lines  $2x + 3y = 12$  and  $-2x - Ky = 6$  are perpendicular for what value of  $K$ ?

Linear systems

a)  $-4/3$

b)  $-3/2$

c)  $-1/2$

d)  $1/2$

e)  $3/2$

slope of  $2x + 3y = 12$

$$3y = -2x + 12$$

$$y = -2/3x + 4 \text{ is } -2/3$$

therefore, slope of perpendicular

is  $3/2$

$$-2x - Ky = 6$$

$$-Ky = 2x + 6$$

$$y = -2x/K - 6/K$$

$$\text{now, set } \frac{-2}{K} = \frac{3}{2}$$

$$K = -4/3$$

5) The range of  $y = -|x + 2| + 5$

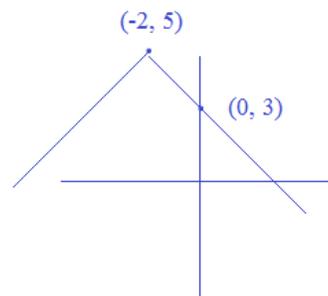
a)  $y \leq -2$

b)  $y \leq 2$

c)  $y \leq 5$

d)  $y \geq 2$

e)  $y \geq 5$



max y-value:  
5

Domain & Range  
of Functions

SAT Subject Test -- Math Level 2 Topics to Know

SOLUTIONS

6)  $f(x) = -2x^2$  is translated 3 units to the right and 1 unit up.  
 If the resulting graph is  $g(x)$ , then what is  $g(-1)$ ?

Functions, translation, and transformation

- a) -31
  - b) -24
  - c) -7
  - d) -4
  - e) 0
- If function moves 1 unit up, then it becomes  $-2x^2 + 1$
- Then, if function moves 3 units to the right, it becomes  $-2(x - 3)^2 + 1$
- So,  $g(-1) = -31$

7) A sequence is (recursively) defined as  $a_1 = 0$  What is  $a_6$ ?

Sequences and Series

- a) 6
  - b) 11
  - c) 20
  - d) 31
  - e) 55
- $a_2 = 1$
- and, for  $n > 2$
- $$a_n = a_{n-1} + 6a_{n-2}$$
- 1st term: 0  
 2nd term: 1  
 3rd term:  $1 + 6(0) = 1$   
 4th term:  $1 + 6(1) = 7$   
 5th term:  $7 + 6(1) = 13$   
 6th term:  $13 + 6(7) = 55$

8) The table shows the number of math books sold during the last 3 days.  
 The prices of geometry, algebra, and trigonometry are \$57, \$47 and \$74 respectively.  
 Which of the following matrices gives the total revenue, in dollars, from the books for each of the last 3 days?

Matrices and Tables

	saturday	sunday	monday
geometry	28	7	40
algebra	20	11	27
trigonometry	7	4	30

a)  $\begin{bmatrix} 28 & 7 & 40 \\ 20 & 11 & 27 \\ 7 & 4 & 30 \end{bmatrix} \begin{bmatrix} 57 & 47 & 74 \end{bmatrix}$

b)  $\begin{bmatrix} 57 & 47 & 74 \end{bmatrix} \begin{bmatrix} 28 & 7 & 40 \\ 20 & 11 & 27 \\ 7 & 4 & 30 \end{bmatrix}$

c)  $\begin{bmatrix} 57 \\ 47 \\ 74 \end{bmatrix} \begin{bmatrix} 28 & 7 & 40 \\ 20 & 11 & 27 \\ 7 & 4 & 30 \end{bmatrix}$

d)  $\begin{bmatrix} 28 & 7 & 40 \\ 20 & 11 & 27 \\ 7 & 4 & 30 \end{bmatrix} \begin{bmatrix} 57 \\ 47 \\ 74 \end{bmatrix}$

e)  $57 \begin{bmatrix} 28 & 7 & 40 \\ 20 & 11 & 27 \\ 7 & 4 & 30 \end{bmatrix} + 47 \begin{bmatrix} 28 & 7 & 40 \\ 20 & 11 & 27 \\ 7 & 4 & 30 \end{bmatrix} + 74 \begin{bmatrix} 28 & 7 & 40 \\ 20 & 11 & 27 \\ 7 & 4 & 30 \end{bmatrix}$

9) If integers  $n > 3$  and  $p > 3$ , how many pairs  $(n, p)$  satisfy the inequality  $2n + 2p < 20$ ?

Miscellaneous, logic, numbers, arithmetic

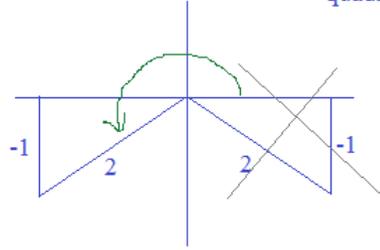
- a) 3
  - b) 4
  - c) 5
  - d) 6
  - e) 7
- test pairs  $(n, p)$ :  $(4, 4): 8 + 8 < 20$  yes  
 $(4, 5): 8 + 10 < 20$  yes  
 $(5, 4): 10 + 8 < 20$  yes  
 $(5, 5): 10 + 10 < 20$  no
- only 3 pairs...

10) If  $\sin x = -\frac{1}{2}$  and  $\tan x > 0$ , then  $x =$

Trigonometry

- a)  $-\frac{\pi}{6}$
- b)  $\frac{\pi}{6}$
- c)  $\frac{5\pi}{6}$
- d)  $\frac{7\pi}{6}$**
- e)  $\frac{11\pi}{6}$

since  $\tan > 0$ , the terminal side of the angle must be in quadrant III

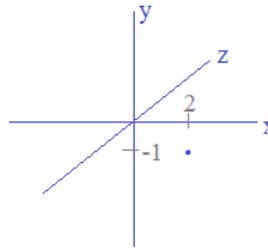


$x = 210$  degrees  
which equates to  
 $7\pi/6$

11) The point  $(2, -1, 0)$  lies on the

3-Dimension Coordinate Space

- a) y-axis
- b) z-axis
- c) xy-plane**
- d) xz-plane
- e) yz-plane



12) If  $ax^3 + bx^2 + c$  is divided by  $(x - 3)$ , then the remainder is:

Polynomial Roots and Theorems

- a)  $-27a + 9b + c$
- b)  $-27a - 9b$
- c)  $27a + 9b + c$**
- d)  $27a + 9b$
- e)  $-27a + 9b$

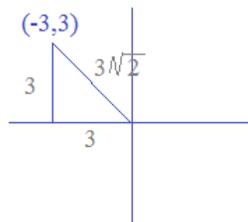
(remainder theorem)  $a(3)^3 + b(3)^2 + c$  is the remainder  
 $27a + 9b + c$

If a polynomial  $f(x)$  is divided by a linear term  $(x - a)$  --- and the remainder is  $r$  --- then  $f(a) = r$

13) What are the polar coordinates of a point with  $(-3, 3)$  rectangle coordinates?

Polar coordinates

- a)  $(3, 135^\circ)$
- b)  $(-3, 135^\circ)$
- c)  $(3\sqrt{2}, 45^\circ)$
- d)  $(3\sqrt{2}, 135^\circ)$**
- e)  $(-3\sqrt{2}, 45^\circ)$



$x = r \cos \Theta$   
 $y = r \sin \Theta$

14) Let  $\log(x) = 3$  and  $\log(y) = 5$ ; Find  $\log(x^2 y)$

Logarithms

- a) 11**
- b) 14
- c) 15
- d) 28
- e) 45

logarithm "product/addition" rule:

$$\log(AB) = \log A + \log B$$

$$\log(x^2 y) = \log x + \log x + \log y = 11$$

15) Find  $(5 + 2i)(5 - 2i)$   $i^2 = -1$

Complex Numbers

- a)  $25 - 4i$
- b)  $25 - 20i$
- c) 21
- d) 29**
- e) 0

FOIL:  $25 - 10i + 10i - 4i^2$   
 $25 - 4(-1) = 29$

16) The length of the major axis in the ellipse  $4(x + 5)^2 + 9y^2 = 36$  is

Conics

- a) 3
- b) 4
- c) 5
- d) 6**
- e) 9

$\frac{(x + 5)^2}{9} + \frac{y^2}{4} = 1$  (center of ellipse is  $(-5, 0)$ )  
 $\frac{(x - h)^2}{a^2} + \frac{(y - k)^2}{b^2} = 1$  (a is the length of the "semi-major" axis)  
 $a^2 = 9$   
 $a = 3$   
 $2a = 6$  (2a is the length of the entire major axis)

17)  $\cos 2x + \cos x = 0$  On the interval  $[0, 2\pi)$ ,  $x =$

Trig Identities

- a)  $\pi$
- b)  $\frac{\pi}{2}, \frac{3\pi}{2}$
- c)  $\frac{\pi}{3}, \pi, \frac{5\pi}{3}$**
- d)  $\frac{2\pi}{3}, \frac{4\pi}{3}$
- e)  $\frac{2\pi}{3}, \pi, \frac{4\pi}{3}$

(trig identity)  
 $2\cos^2 x - 1 + \cos x = 0$   
 (factor and solve)  
 $2\cos^2 x + \cos x - 1 = 0$   
 $(2\cos x - 1)(\cos x + 1) = 0$

$\cos x + 1 = 0$   
 $\cos x = -1$   
 $x = \pi$

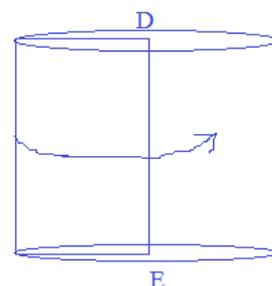
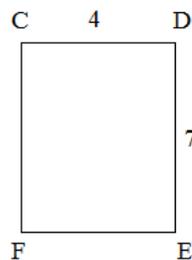
$2\cos x - 1 = 0$   
 $\cos x = \frac{1}{2}$   
 $x = \frac{\pi}{3}$  and  $\frac{5\pi}{3}$

18) If rectangle CDEF is rotated about side DE, it creates a cylinder of volume:

Area and Volume (Cylinders, Prisms, Pyramids, etc.)

- a)  $28\pi$
- b)  $56\pi$
- c)  $98\pi$
- d)  $112\pi$**
- e)  $196\pi$

Volume (cylinder) = area of top(height)  
 $= \pi r^2(\text{height})$   
 $= \pi(4)^2(7)$   
 $= 112\pi$



- 19) Tom can paint a fence in 5 hours. Huck can paint a fence in 8 hours. If they work together, how long would it take for them to paint *three* fences?

Word Problems

- a) 3 hours 5 minutes  
 b) 6 hours 30 minutes  
 c) 9 hours 14 minutes  
 d) 10 hours 20 minutes  
 e) 11 hours 42 minutes

(list variables/formulas)

work = rate x time

Tom: 1 fence = rate x 5 hours

$$\text{Tom's rate} = \frac{1 \text{ fence}}{5 \text{ hours}}$$

Huck: 1 fence = rate x 8 hours

$$\text{Huck's rate} = \frac{1 \text{ fence}}{8 \text{ hours}}$$

(set up equations)

To paint one fence together:

$$\frac{1 \text{ fence}}{5 \text{ hours}} t + \frac{1 \text{ fence}}{8 \text{ hours}} t = 3 \text{ fences}$$

(Tom)

(Huck)

(solve)

(multiply by 40 hours)

$$8 \text{ fences}(t) + 5 \text{ fences}(t) = 120 \text{ fences}(\text{hours})$$

$$13 \text{ fences}(t) = 120 \text{ fences}(\text{hours})$$

$$t = 9.23 \text{ hours}$$

9 hours 14 minutes

(check)

Tom: 9.23 hours  
paints 1.846 fencesHuck: 9.23 hours  
paints 1.15 fences

together: 3 fences! ✓

- 20)  $u = \langle 3, -2 \rangle$   $v = \langle 4, 1 \rangle$  The magnitude of  $u + v$  is

Vectors

- a) 6  
 b) 10  
 c)  $5\sqrt{2}$   
 d)  $4\sqrt{3}$   
 e)  $\langle 7, -1 \rangle$

$$u + v = \langle 7, -1 \rangle \quad \text{then, the magnitude is } \sqrt{(7)^2 + (-1)^2} = \sqrt{50}$$

- 21) A line has the parametric equation  $x = t + 5$  and  $y = t + 10$ . What is the slope of the line?

Parametric Equations

- a) 1  
 b) 2  
 c) 5  
 d) 10  
 e) 50

$$x = t + 5$$

so,

$$t = x - 5$$

then, using substitution,

$$y = (x - 5) + 10 \quad \longrightarrow \quad y = x + 5 \quad (\text{slope is } 1)$$

- 22) The 4th term in the binomial expansion  $(m - p)^7$  is

Binomial Expansion

- a)  $4mp$   
 b)  $35mp$   
 c)  $35m^4 p^3$   
 d)  $-35m^4 p^3$   
 e)  $-70m^4 p^3$

$$m^7 - 7m^6 p + 21m^5 p^2 - 35m^4 p^3 + 35m^3 p^4 - 21m^2 p^5 + 7m p^6 - p^7$$

Thanks for checking out this introductory packet of math questions. (Hope it helps!). If you have questions, suggestions, or requests, let us know!

Cheers,

Lance..

Looking for more practice SAT Subject **Math Level 2** Questions (w/solutions)?

Visit the ACT/SAT section at [Mathplane.com](https://www.mathplane.com)...

- 1) A game has 2 spinners. Spinner #1 has a probability of landing red of  $\frac{2}{3}$ . And, spinner #2 has a probability of landing red of  $\frac{1}{5}$ .  
What is the probability spinner #1 lands red AND spinner #2 does NOT land red?

- a)  $\frac{2}{15}$
- b)  $\frac{8}{15}$
- c)  $\frac{13}{15}$
- d)  $\frac{1}{5}$
- e)  $\frac{3}{5}$

- 2) For some positive real number 'b',  $b - 1$ ,  $b + 4$ ,  $3b + 2$ . What is the

- a) 16
- b) 20
- c) 24
- d) 28
- e) 40

**150 SAT Subject Test  
Math Level 2  
Practice Questions**  
(and, Solutions)

- 3) Which equation best models the following data in the table:

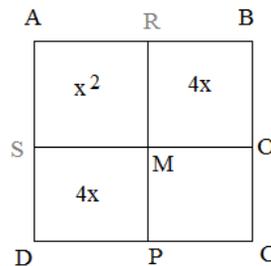
x	-6.7	-1.3	3.2	8.8
y	1.30	3.47	7.89	21.89

- a)  $y = 1.2(4.4)^x$
- b)  $y = 4.4(1.2)^x$
- c)  $y = -1.2(4.4)^x$
- d)  $y = -4.4(1.2)^x$
- e)  $y = 1.2x^{4.4}$

by Lance Friedman

- 4) The figure shows a square region divided into 4 rectangle regions. If the area of ABCD is 100 what is the area of MOCP?

- a) 16
- b) 24
- c) 28
- d) 36
- e) 64



- 5)  $\sin(\tan^{-1}3) =$

- a)  $\frac{1}{3}$
- b)  $\frac{3\sqrt{10}}{10}$
- c)  $\frac{1}{2}$
- d)  $\frac{\sqrt{2}}{3}$
- e)  $\frac{3}{10}$

(Thanks for your support! Proceeds go to site maintenance and treats for Oscar the dog!)