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TD 1
SAT (Scholastic Assessment Test) and CEMC

Les exercices suivants sont tirés des sujets d'entraînement disponibles sur le site du SAT (link) et des concours du CEMC (link), « *the Center for Education in Mathematics and Computing* » comme Gauss, Pascal ...

— Pour avoir les sujets originaux du SAT : https://www.math93.com/.../sat

— Gauss7-2021-1998 / Gauss8-2021-1998 / Pascal9-2021-1998

— For SAT practice tests, in the section 3 : " The use of a calculator is not permitted."

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Première partie

Racines carrées

Exercice 1. CEMC contest Gauss and Pascal

Question 1 (Pascal 2015)

The value of $\sqrt{16 \times \sqrt{16}}$ is :

a. 2^1 **b.** 2^2 **c.** 2^3 **d.** 2^4 **e.** 2^5

Question 2 (Pascal 2013)

The expression $\left(\sqrt{100}+\sqrt{9}\right)\left(\sqrt{100}-\sqrt{9}\right)$ is equal to :

a. 91 **b.** 19 **c.** 9991 **d.** 9919 **e.** 10 991

Question 3 (Gaus8 2020)

A perfect square is a whole number whose square root is also a whole number. For example, 144 is a perfect square since its square root is 12. How many perfect squares are there between 2 and 20?

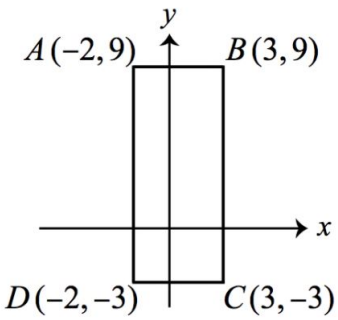
a. 0 **b.** 1 **c.** 2 **d.** 3 **e.** 4

Deuxième partie

Pythagoras of Samos (c. 570 – c. 495 BC)

Question 4 (Gaus8 2016)

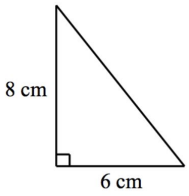
In the diagram, what is the length of BD?



a. 13 **b.** 17 **c.** $\sqrt{205}$ **d.** $\sqrt{160}$ **e.** 15

Question 5 (Gaus8 2015)

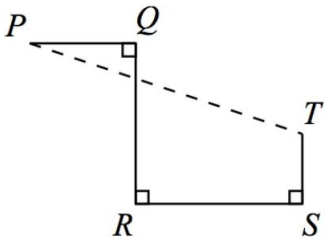
There is a square whose perimeter is the same as the perimeter of the triangle shown. The area of that square is



a. 12.25 cm^2 **b.** 196 cm^2 **c.** 49 cm^2 **d.** 36 cm^2 **e.** 144 cm^2

Question 6 (Pascal 2016)

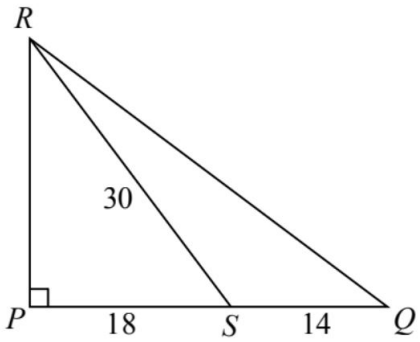
In the diagram, PQ is perpendicular to QR, QR is perpendicular to RS, and RS is perpendicular to ST. If PQ = 4, QR = 8, RS = 8, and ST = 3, then the distance from P to T is



a. 16 **b.** 12 **c.** 17 **d.** 15 **e.** 13

Question 7 (Pascal 2014)

In ΔPQR, ∠RPQ = 90° and S is on PQ.
If SQ = 14, SP = 18, and SR = 30, then the area of ΔQRS is :



a. 84 **b.** 168 **c.** 210 **d.** 336 **e.** 384

Troisième partie

Rational numbers

Question 8 (SAT - Practice test 1 - section 3 - Q8)

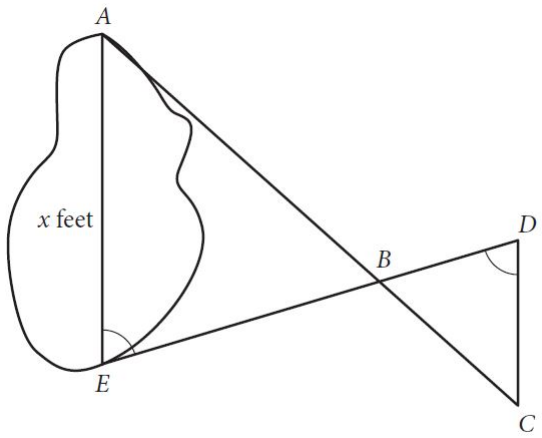
If $\frac{a}{b} = 2$, what is the value of $\frac{4b}{a}$?

a. 0 **b.** 1 **c.** 2 **d.** 4

Quatrième partie

Thalès (France) (ou triangles semblables)/ Intercept Theorem (US & UK)

Exercice 2. Sat 1 - Section 3 - Q 17

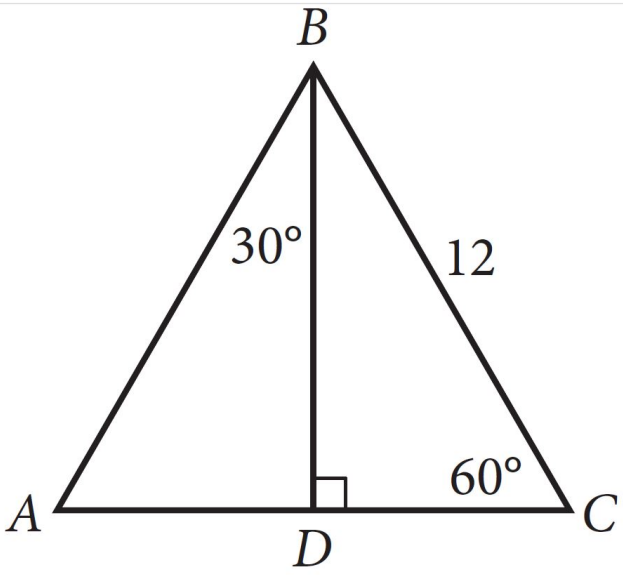


A summer camp counselor wants to find a length, x, in feet, across a lake as represented in the sketch above. The lengths represented by AB, EB, BD, and CD on the sketch were determined to be 1800 feet, 1400 feet, 700 feet, and 800 feet, respectively.
Segments AC and DE intersect at B, and $\angle AEB$ and $\angle CDB$ have the same measure. What is the value of x?

Cinquième partie

Trigonometry

Question 9 (SAT - Practice test 5 - section 4 - Q19)



In △ ABC above, what is the length of $\overline{AD}$?

a. 4 **b.** 6 **c.** $6\sqrt{2}$ **d.** $6\sqrt{3}$

Sixième partie

Equations

Question 10 (SAT - Practice test 1 - section 3 - Q1)

If $\frac{x-1}{3} = k$ and $k = 3$, what is the value of x?

a. 2 **b.** 4 **c.** 9 **d.** 10

Question 11 (SAT - Practice test 1 - section 3 - Q9)

$$\begin{cases} 3x + 4y = -23 \\ 2y - x = -19 \end{cases}$$

What is the solution (x, y) to the system of equations above?

a. $(-5, -2)$ **b.** $(3, -8)$ **c.** $(4, -6)$ **d.** $(9, -6)$

Question 12 (SAT - Practice test 1 - section 3 - Q11)

$$\begin{cases} b = 2.35 + 0.25x \\ c = 1.75 + 0.40x \end{cases}$$

In the equations above, b and c represent the price per pound, in dollars, of beef and chicken, respectively, x weeks after July 1 during last summer.
What was the price per pound of beef when it was equal to the price per pound of chicken?

a. \$2.60 **b.** \$2.85 **c.** \$2.95 **d.** \$3.35

Question 13 (SAT - Practice test 1 - section 3 - Q16)

If $t > 0$ and $t^2 - 4 = 0$, what is the value of t?

Question 14 (SAT - Practice test 1 - section 4 - Q2)

If $y = kx$, where k is a constant, and $y = 24$ when $x = 6$, what is the value of y when $x = 5$?

a. 6 **b.** 15 **c.** 20 **d.** 23

Question 15 (SAT - Practice test 1 - section 4 - Q4)

If $16 + 4x$ is 10 more than 14, what is the value of $8x$?

a. 2 **b.** 6 **c.** 16 **d.** 80

Question 16 (SAT - Practice test 1 - section 4 - Q9)

$$a = 1,052 + 1.08t$$

The speed of a sound wave in air depends on the air temperature. The formula above shows the relationship between a, the speed of a sound wave, in feet per second, and t, the air temperature, in degrees Fahrenheit (°F).
Which of the following expresses the air temperature in terms of the speed of a sound wave?

a. $t = \dfrac{a - 1,052}{1.08}$ **b.** $t = \dfrac{a + 1,052}{1.08}$ **c.** $t = \dfrac{1,052 - a}{1.08}$ **d.** $t = \dfrac{1.08}{a + 1,052}$

Question 17 (SAT - Practice test 1 - section 4 - Q10)

$$a = 1,052 + 1.08t$$

The speed of a sound wave in air depends on the air temperature. The formula above shows the relationship between a, the speed of a sound wave, in feet per second, and t, the air temperature, in degrees Fahrenheit (°F).
At which of the following air temperatures will the speed of a sound wave be closest to 1,000 feet per second?

a. $-46°F$ **b.** $-48°F$ **c.** $-49°F$ **d.** $-50°F$

Question 18 (SAT - Practice test 1 - section 4 - Q25)

$$h = -4.9t^2 + 25t$$

The equation above expresses the approximate height h, in meters, of a ball t seconds after it is launched vertically upward from the ground with an initial velocity of 25 meters per second. After approximately how many seconds will the ball hit the ground?

a. 3.5 **b.** 4.0 **c.** 4.5 **d.** 5.0

Question 19 (SAT - Practice test 1 - section 3 - Q4)

Kathy is a repair technician for a phone company. Each week, she receives a batch of phones that need repairs. The number of phones that she has left to fix at the end of each day can be estimated with the equation $P = 108 - 23d$, where P is the number of phones left and d is the number of days she has worked that week. What is the meaning of the value 108 in this equation?

a. Kathy will complete the repairs within 108 days. **b.** Kathy starts each week with 108 phones to fix. **c.** Kathy repairs phones at a rate of 108 per hour. **d.** Kathy repairs phones at a rate of 108 per day.

Septième partie

Functions

Question 20 (SAT - Practice test 1 - section 3 - Q10)

The use of a calculator is NOT permitted in the section 3 of the SAT test

$$g(x) = ax^2 + 24$$

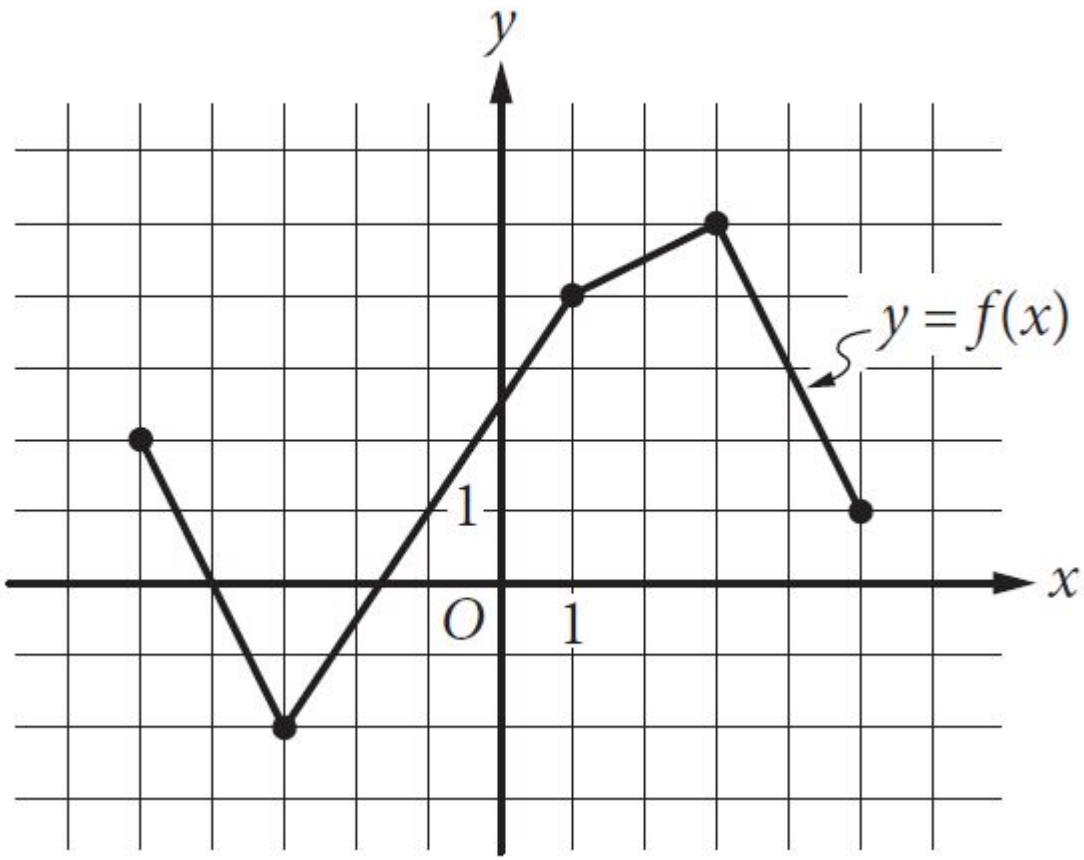
For the function g defined above, a is a constant and $g(4) = 8$.
What is the value of $g(-4)$?

a. 8 **b.** 0 **c.** -1 **d.** -8

Question 21 (SAT - Practice test 1 - section 4 - Q17)

The use of a calculator is permitted in the section 4 of the SAT test

The complete graph of the function f is shown in the xy-plane above.



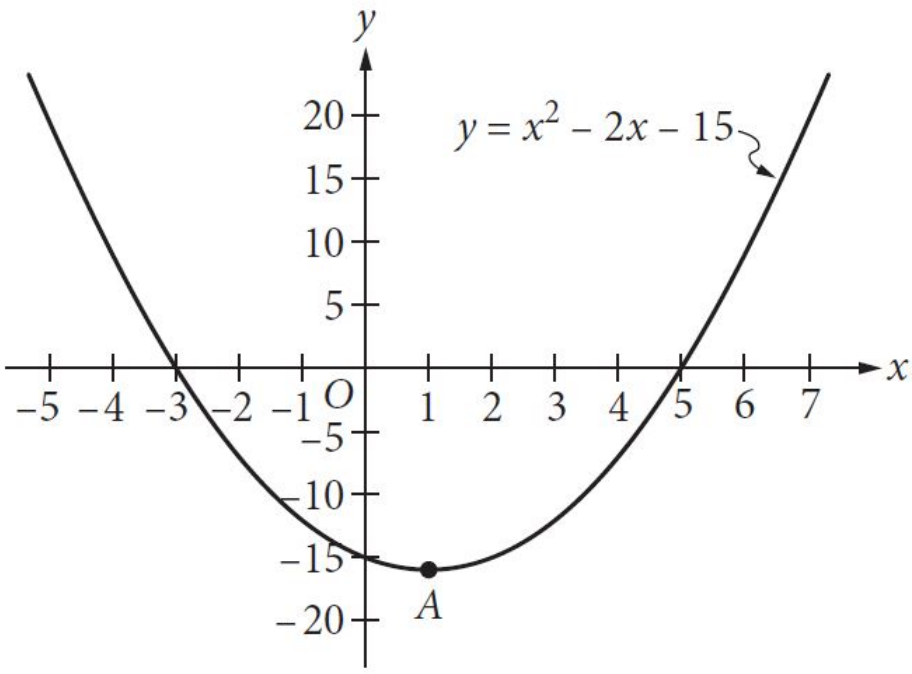
For what value of x is the value of $f(x)$ at its minimum?

a. -5 **b.** -3 **c.** -2 **d.** 3

Question 22 (SAT - Practice test 1 - section 4 - Q30)

The use of a calculator is permitted in the section 4 of the SAT test

Which of the following is an equivalent form of the equation of the graph shown in the xy-plane above,from which the coordinates of vertex A can be identified as constants in the equation?

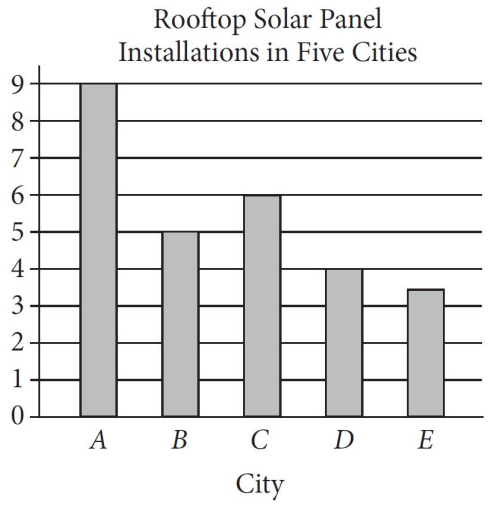


a. $y = (x+3)(x-5)$ **b.** $y = (x-3)(x+5)$ **c.** $y = x(x-2)-15$ **d.** $y = (x-1)^2 - 16$

Huitième partie

Statistics

Question 23 (SAT - Practice test 1 - section 4 - Q7)



The number of rooftops with solar panel installations in 5 cities is shown in the graph above. If the total number of installations is 27,500, what is an appropriate label for the vertical axis of the graph?

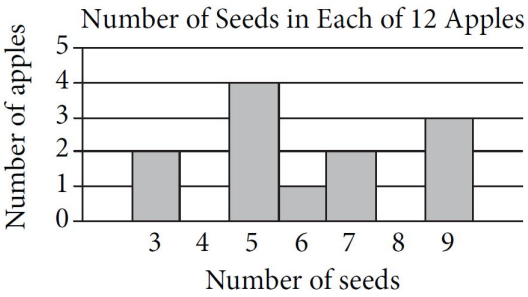
a. Number of installations (in tens)

b. Number of installations (in hundreds)

c. Number of installations (in thousands)

d. Number of installations (in tens of thousands)

Question 24 (SAT - Practice test 1 - section 4 - Q12)



Based on the histogram above, of the following, which is closest to the average (arithmetic mean) number of seeds per apple?

a. 4

b. 5

c. 6

d. 7

Question 25 (SAT - Practice test 1 - section 4 - Q13)

		Course			
		Algebra I	Geometry	Algebra II	Total
Gender	Female	35	53	62	150
	Male	44	59	57	160
	Total	79	112	119	310

A group of tenth-grade students responded to a survey that asked which math course they were currently enrolled in. The survey data were broken down as shown in the table above. Which of the following categories accounts for approximately 19 percent of all the survey respondents?

a. Females taking Geometry **b.** Females taking Algebra II **c.** Males taking Geometry **d.** Males taking Algebra I

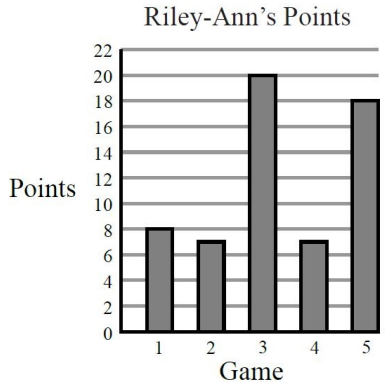
Question 26 (SAT - Practice test 1 - section 4 - Q14)

Lengths of Fish (in inches)						
8	9	9	9	10	10	11
11	12	12	12	12	13	13
13	14	14	15	15	16	24

The table above lists the lengths, to the nearest inch, of a random sample of 21 brown bullhead fish. The outlier measurement of 24 inches is an error. Of the mean, median, and range of the values listed, which will change the most if the 24-inch measurement is removed from the data?

a. Mean **b.** Median **c.** Range **d.** They will all change by the same amount.

Question 27 (Gauss contest - 2014 - Q16 (link))



The graph shows points scored by Riley-Ann in her first five basketball games. The difference between the mean and the median of the number of points that she scored is :

a. 1 **b.** 2 **c.** 3 **d.** 4 **e.** 5

Neuvième partie

Probability

Question 28 (SAT - Practice test 1 - section 4 - Q21)

Dreams Recalled during One Week

	None	1 to 4	5 or more	Total
Group X	15	28	57	100
Group Y	21	11	68	100
Total	36	39	125	200

The data in the table above were produced by a sleep researcher studying the number of dreams people recall when asked to record their dreams for one week. Group X consisted of 100 people who observed early bedtimes, and Group Y consisted of 100 people who observed later bedtimes. If a person is chosen at random from those who recalled at least 1 dream, what is the probability that the person belonged to Group Y?

a. $\frac{68}{100}$ **b.** $\frac{79}{100}$ **c.** $\frac{79}{164}$ **d.** $\frac{164}{200}$

Question 29 (SAT - Practice test 3 - section 4 - Q2)

	Age		Total
Gender	Under 40	40 or older	
Male	12	2	14
Female	8	3	11
Total	20	5	25

The table above shows the distribution of age and gender for 25 people who entered a contest. If the contest winner will be selected at random, what is the probability that the winner will be either a female under age 40 or a male age 40 or older?

a. $\frac{4}{25}$ **b.** $\frac{10}{25}$ **c.** $\frac{11}{25}$ **d.** $\frac{16}{25}$

Question 30 (SAT - Practice test 5 - section 4 - Q14)

Type of surgeon	Major professional activity		Total
	Teaching	Research	
General	258	156	414
Orthopedic	119	74	193
Total	377	230	607

In a survey, 607 general surgeons and orthopedic surgeons indicated their major professional activity. The results are summarized in the table above. If one of the surgeons is selected at random, which of the following is closest to the probability that the selected surgeon is an orthopedic surgeon whose indicated professional activity is research?

a. 0.122 **b.** 0.196 **c.** 0.318 **d.** 0.379