

SHORTEST AND EASIEST SOLUTIONS FOR MATH (2016 NEW SAT)

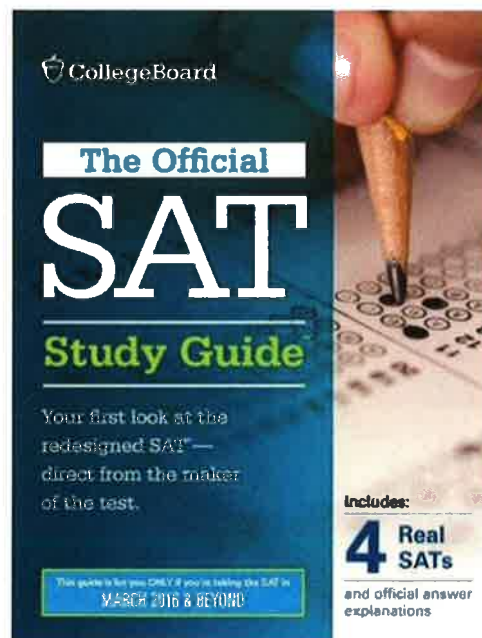
By **Aspire Test Prep, LLC**

Founded by Rajiv Gupta, Ph.D. who scored 800/800 on Math
section of GRE



EXAMPLE QUESTIONS

From College Board's Official SAT Study Guide for 2016 NEW SAT



SYMBOLS USED

\Rightarrow which implies that

\therefore Therefore

\approx Approximately equal to

Δ Change in value; or delta, or difference in value

* SAE Shortest and Easiest solution for the given problem

EXAMPLE # 1

COLLEGE BOARD 2016 NEW SAT PRACTICE TEST # 1, SECTION 3, QUESTION 1

COLLEGE BOARD'S ANSWER EXPLANATION

$$\text{Given } 5x + 6 = 10$$

$$\Rightarrow 5x + 6 - 6 = 10 - 6$$

$$\Rightarrow 5x = 4$$

$$\Rightarrow \frac{5x}{5} = \frac{4}{5}$$

$$\Rightarrow x = \frac{4}{5}$$

Now substitute value of x
into $10x + 3$

$$\begin{aligned} \therefore 10x + 3 &= 10\left(\frac{4}{5}\right) + 3 \\ &= 8 + 3 \\ &= \textcircled{11} \end{aligned}$$

The description above captures the essence. Please read their explanation in College Board's Study Guide.

OUR APPROACH

$$\text{Given } 5x + 6 = 10$$

$$\Rightarrow 5x = 4$$

$$\Rightarrow 10x = 8$$

Multiplying by 2 on both sides

$$\Rightarrow 10x + 3 = 8 + 3$$

Adding 3 on both sides

$$= \textcircled{11}$$

SAE

Recognize that you do NOT need to find the value of x first, and then substitute the value of x .

Save time on questions like this, so that you have more time for some of the longer questions.

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EXAMPLE # 2

COLLEGE BOARD 2016 NEW SAT PRACTICE TEST #2, SECTION 3, QUESTION 6

COLLEGE BOARD'S ANSWER EXPLANATION

$$\begin{aligned}\text{Slope of line } l &= \frac{0-2}{-5-0} \\ &= \frac{-2}{-5} \\ &= \frac{2}{5}\end{aligned}$$

$$\begin{aligned}\text{Slope of line } k &= \frac{-4-0}{0-p} \\ &= \frac{-4}{-p} \\ &= \frac{4}{p}\end{aligned}$$

Since lines l and k are parallel, their slopes are equal.

$$\therefore \frac{2}{5} = \frac{4}{p}$$

$$\Rightarrow 2p = 20$$

$$\Rightarrow p = \textcircled{10}$$

The description above captures the essence. Please read College Board's explanation in their Study Guide.

OUR APPROACH

Recognize that since lines l and k are parallel, the two triangles are SIMILAR. So the lengths of their sides are proportional.

$$\therefore \frac{p}{4} = \frac{5}{2}$$

$$\Rightarrow 2p = 20$$

$$\Rightarrow p = \textcircled{10}$$

SAE

Recognize that this question type on co-ordinate geometry was converted to a geometry of similar triangles.

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EXAMPLE # 3

COLLEGE BOARD 2016 NEW SAT PRACTICE TEST #2, SECTION 3, QUESTION 3

COLLEGE BOARD'S ANSWER EXPLANATION

Price, in dollars = $60 + 12nh$

60 is fixed price

$12nh$ depends on number of landscapers, n and number of hours, h worked by the n landscapers.

nh is total hours of work when n landscapers work h hours

So, cost of job increases by \$12 for every hour worked by a landscaper.

∴ 12 refers to \$12 per hour for each landscaper.

Answer (A)

The description above captures the essence. Please read College Board's explanation in their Study Guide.

OUR APPROACH

Recognize that for questions of this type, use UNITS for a faster and easier solution.

Unit of $12nh = \$$

$$\Rightarrow 12 \times (\text{number of landscapers}) \times (\text{hours}) = \$$$

$$\Rightarrow 12 = \frac{\$}{(\text{number of landscapers}) \times (\text{hours})}$$

∴ 12 refers to \$ per hour per landscaper

Answer (A)
SAE

Recognize that this is a systematic approach using UNITS which makes it easier to interpret the numbers.

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EXAMPLE # 4

COLLEGE BOARD 2016 NEW SAT PRACTICE TEST # 2, SECTION 4, QUESTION 2

COLLEGE BOARD'S ANSWER EXPLANATION

Manager selects 7 bulbs for inspection out of every 400 bulbs produced.

$$20,000 \text{ bulbs equals } \frac{20,000}{400} \\ = 50 \text{ batches of 400 bulbs}$$

∴ At the rate of 7 bulbs per 400 bulbs produced, the manager will inspect a total of $50 \times 7 = 350$ bulbs

The description above captures the essence. Please read College Board's explanation in their Study Guide.

OUR APPROACH

Recognize that this is a question on DIRECT PROPORTION, and set up a systematic equation for rate.

$$\frac{\text{Inspected}}{\text{Produced}} = \frac{7}{400} = \frac{x}{20,000}$$

$$\Rightarrow x = \frac{7 \times 20,000}{400}$$

$$= \boxed{350} \\ \boxed{\text{SAE}}$$

Note that setting up such an equation provides clarity and minimizes the chances of making a mistake.

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EXAMPLE # 5

COLLEGE BOARD 2016 NEW SAT PRACTICE TEST #4, SECTION 4, QUESTION 32

COLLEGE BOARD'S
ANSWER EXPLANATION

Given equation:

$$P = \frac{x + 220}{2}$$

$$= \frac{1}{2}x + 110$$

When x increases by 1 year,
 P becomes:

$$\frac{1}{2}(x+1) + 110$$

$$= \left(\frac{1}{2}x + 110\right) + \frac{1}{2}$$

which means P increases by
 $\left(\frac{1}{2}\right)$ mm of mercury

The description above captures the essence. Please read College Board's explanation in their Study Guide.

OUR APPROACH

Recognize that for the given LINEAR equation, with form $y = mx + b$

$$\text{slope} = m = \frac{1}{2} = \frac{\text{change in } P}{\text{change in } x} = \frac{\Delta P}{\Delta x}$$

For $\Delta x = \text{delta } x = 1$ year increase

$$\therefore \frac{1}{2} = \frac{\Delta P}{1}$$

$$\Rightarrow \Delta P = \left(\frac{1}{2}\right) = \text{increase in } P$$

SAE

Note that this approach can be EASILY applied to more complex linear equations as well.

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EXAMPLE #6

COLLEGE BOARD 2016 NEW SAT PRACTICE TEST #4, SECTION 3, QUESTION 16

COLLEGE BOARD'S ANSWER EXPLANATION

For the given three shelves of the triangular system, the similarity ratios of the 3 triangles are:

$$\text{smallest} : \text{middle} = 2 : 5$$

$$\text{smallest} : \text{largest} = 2 : 6 \text{ or } 1 : 3$$

$$\text{middle} : \text{largest} = 5 : 6$$

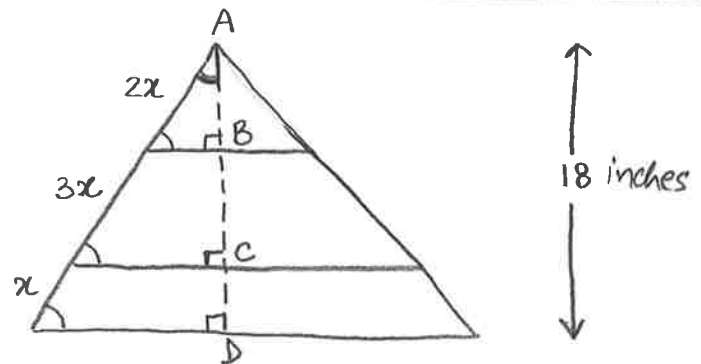
$$\begin{aligned} \text{Height of middle shelf} &= \frac{5}{6} \times 18 \\ &= 15 \text{ inches} \\ &= AC \end{aligned}$$

$$\begin{aligned} \text{Height of middle shelf} &= \frac{1}{3} \times 18 \\ &= 6 \text{ inches} \\ &= AB \end{aligned}$$

$$\begin{aligned} \therefore \text{Height of middle shelf} & \\ &= 15 - 6 \\ &= \textcircled{9} \text{ inches} \end{aligned}$$

The description above captures the essence. Please read College Board's explanation in their Study Guide.

OUR APPROACH



Recognize that for the 3 similar triangles, $AB : \textcircled{BC} : CD$

$$\begin{aligned} &= 2x : 3x : x \\ &= 2 : \textcircled{3} : 1 \end{aligned}$$

$$\begin{aligned} \therefore BC &= \text{height of middle shelf} \\ &= \frac{3}{(2+3+1)} \times 18 \text{ inches} \\ &= \frac{3}{6} \times 18 = \textcircled{9} \text{ inches} \\ &\quad \text{SAE} \end{aligned}$$

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EXAMPLE # 7

COLLEGE BOARD 2016 NEW SAT PRACTICE TEST # 4, SECTION 4, QUESTION 25

COLLEGE BOARD'S ANSWER EXPLANATION

Given $f(x) = 2x^3 + 6x^2 + 4x$
 $g(x) = x^2 + 3x + 2$

Re-writing $f(x)$ as

$$f(x) = 2x(x^2 + 3x + 2)$$

or $f(x) = 2x \cdot g(x)$ by substitution ①

Choice B

$$\begin{aligned} p(x) &= f(x) + 3g(x) \\ &= 2x \cdot g(x) + 3g(x) \\ &= (2x+3) \cdot g(x) \end{aligned}$$

$\therefore p(x)$ is divisible by $2x+3$

Choice A

$$\begin{aligned} h(x) &= f(x) + g(x) \\ &= 2x \cdot g(x) + g(x) \\ &= (2x+1) \cdot g(x) \\ &= (2x+1)(x+1)(x+2) \end{aligned}$$

Choice C

$$\begin{aligned} r(x) &= 2f(x) + 3g(x) \\ &= 4x \cdot g(x) + 3g(x) \\ &= (4x+3) \cdot g(x) \\ &= (4x+3)(x+1)(x+2) \end{aligned}$$

Choice D

$$\begin{aligned} s(x) &= 3f(x) + 2g(x) \\ &= 6x \cdot g(x) + 2g(x) \\ &= (6x+2) \cdot g(x) \\ &= 2(3x+1)(x+1)(x+2) \end{aligned}$$

The description above captures the essence. Please read College Board's explanation in their Study Guide.

OUR APPROACH

Recognize that there is NO NEED to calculate the four answer choices since it is very time consuming.

Re-write equation ① as :

$$\frac{f(x)}{g(x)} = 2x$$

$$\Rightarrow \frac{f(x)}{g(x)} + 3 = 2x+3 \quad \text{by adding 3 on both sides}$$

$$\Rightarrow \frac{f(x) + 3g(x)}{g(x)} = 2x+3 \quad \text{--- ②}$$

Since the right side of equation ② is divisible by $2x+3$, then the left side MUST also be divisible by $2x+3$.

$$\Rightarrow f(x) + 3g(x) \text{ MUST be divisible by } 2x+3$$

$$\Rightarrow \text{Answer: } \boxed{\text{Choice B}}$$

SAE

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