Solve Problems Backwards

Hint: If the question is <u>not</u> asking for the least or greatest, then start substituting in the middle answer. Hopefully, if the middle answer is not correct, you will be able to eliminate two other answers. Try to *avoid* substituting in all 5 answer choices!

ACT June 2017

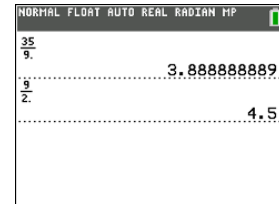15. The ratio of Jane's age to her daughter's age is 9:2. The sum of their ages is 44. How old is Jane?

   A. 22
   B. 33
   C. 35
   D. 36
   E. 40

Substitute the middle answer first!

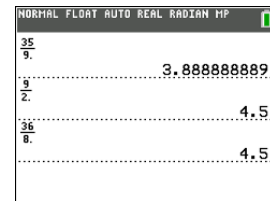$jane = 35$, which means $daughter = 9$

Does $\dfrac{35}{9} = \dfrac{9}{2}$?

The ratio of Jane's age to her daughter is not large enough. Answer choices A & B can be eliminated.

$jane = 36$, which means $daughter = 8$

Does $\dfrac{36}{8} = \dfrac{9}{2}$?

YES!

ACT April 2016

29. What positive number when divided by its reciprocal has a result of $\dfrac{4}{25}$?

   A. $\dfrac{2}{5}$

   B. $\dfrac{2}{25}$

   C. $\dfrac{5}{2}$

   D. $\dfrac{8}{25}$

   E. $\dfrac{25}{8}$

Hint: Use the fraction template.

ACT April 2016

34. A family will rent a picnic shelter for $200 for a reunion. The cost of the shelter will be distributed equally among the people who plan to attend. The current cost per person will decrease by $1 if 10 more people plan to attend the reunion. How many people are currently planning to attend the reunion?

   F. 10
   G. 20
   H. 40
   J. 50
   K. 63

Can you set up an equation to solve this?

Answers: 15D, 29A, 34H

Solve Problems Backwards

ACT December 2016

What answer should you substitute first?

11. Ben is saving money to buy a TV that costs $495, including tax. Ben opens a savings account with a deposit of $75 and deposits $65 at the end of each month. What is the minimum number of months Ben will need to make deposits until he has enough money in his account to buy the TV ?

A. 5
B. 6
C. 7
D. 8
E. 9

ACT June 2017

Pay attention to words that are capitalized!

34. A school admissions office accepts 2 out of every 7 applicants. Given that the school accepted 630 students, how many applicants were NOT accepted?

F. 140
G. 180
H. 490
J. 1,260
K. 1,575

ACT December 2016

What answer is a big distractor here?

8. The cost of a long-distance call to a certain city is $1.05 for the first minute and $0.15 for each additional minute or part thereof. What is the cost of a 15-minute call to this city?

F. $1.20
G. $2.25
H. $3.15
J. $3.30
K. $3.45

ACT April 2017

What are the bad answers here?

12. In Cherokee County, the fine for speeding is $17 for each mile per hour the driver is traveling over the posted speed limit. In Cherokee County, Kirk was fined $221 for speeding on a road with a posted speed limit of 30 mph. Kirk was fined for traveling at what speed, in miles per hour?

F. 13
G. 17
H. 43
J. 47
K. 60

Answers: 11C, 34K, 8H, 12H
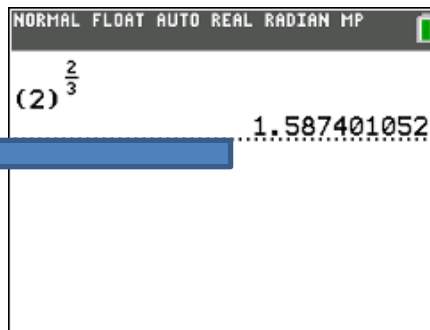
Substitute Numbers

Use this strategy when both the questions and answers have variables. In general, stay away from choosing values like 0 or 1 since those numbers have unique properties. Once you substitute a number and evaluate the question, set all of the answer choices equal to that value. Cross out the incorrect answers as you substitute numbers to each answer choice. It is usually a good idea to test all 5 answer choices when using this strategy.

ACT April 2017

First, choose a value for the variable, x.
$x = 2$, then substitute (with parentheses)!

16. Which of the following expressions is equivalent to $x^{\frac{2}{3}}$?
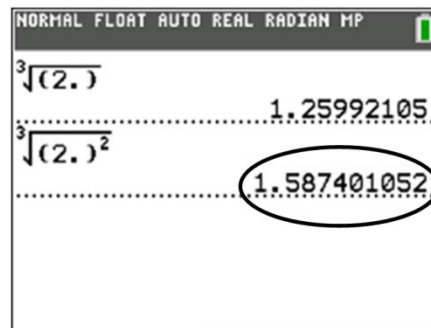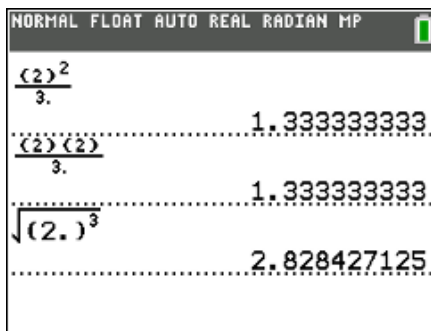
F. $\frac{x^2}{3}$ $\neq 1.587$

G. $\frac{x(2)}{3}$ $\neq 1.587$

H. $\sqrt{x^3}$ $\neq 1.587$

J. $\sqrt[3]{x}$ $\neq 1.587$

K. $\sqrt[3]{x^2}$ $= 1.587$

NORMAL FLOAT AUTO REAL RADIAN MP

$(2)^{\frac{2}{3}}$
   1.587401052

Now, substitute $x = 2$ for all five answer choices.

Cross out the incorrect answer choices.

NORMAL FLOAT AUTO REAL RADIAN MP

$\frac{(2)^2}{3.}$
   1.333333333

$\frac{(2)(2)}{3.}$
   1.333333333

$\sqrt{(2.)^3}$
   2.828427125

NORMAL FLOAT AUTO REAL RADIAN MP

$\sqrt[3]{(2.)}$
   1.25992105

$\sqrt[3]{(2.)^2}$
   1.587401052

ACT April 2016

Hint: Make sure the numbers you pick make the equation true.

40. Each student's project in a history seminar is given a point score by the teacher and by each of the other students in the seminar. A student's project grade, g, is determined by the formula $g = \frac{3t+s}{3+n}$, where t is the score the teacher gives, s is the sum of the scores the students give, and n is the number of students in the seminar. What is t in terms of g, s, and n ?

F. $t = g - n - s$

G. $t = gn + g - s$

H. $t = \frac{3gn - s}{9}$

J. $t = \frac{gn - s}{3}$
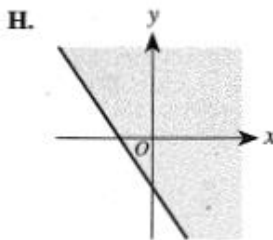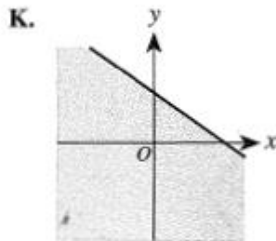
K. $t = \frac{3g + gn - s}{3}$
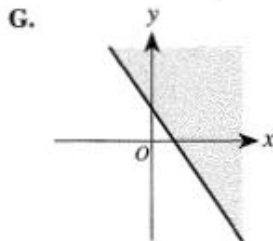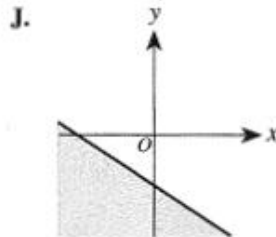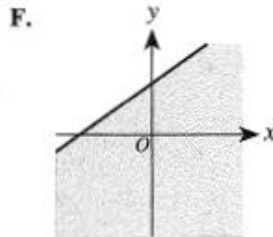
Answers: 16K, 40K

Substitute Numbers

ACT June 2017 How do you check your answers on this problem?

56. Each of the following graphs in the standard (x,y) coordinate plane has the same scale on both axes. One graph is the graph of $ax + by \le c$, where $0 < a < b < c$. Which one is it?

F.

J.

G.

K.

H.

ACT December 2016 Is this a good business model?

37. Suzanne and Chad are going to bake and deliver cookies to college students during final exam week. They estimate it will cost $4 for the ingredients to make each batch of cookies and $50 to buy the mixer, bowls, and other utensils they will need. They decide to sell the cookies for $5 per batch. Assume they have no other expenses. Which of the following equations represents the profit, P dollars, they will make on b batches of cookies?

A. $P = 49b$
B. $P = 54b - 5$
C. $P = 55b - 4$
D. $P = -b + 50$
E. $P = b - 50$

Answers: 56K, 37E

Substitute Numbers

ACT June 2016   What are the bad answers here?

4. $3x^9 \cdot 5x^9$ is equivalent to:

   F. $8x^{18}$
   G. $8x^{81}$
   H. $15x^9$
   J. $15x^{18}$
   K. $15x^{81}$

ACT December 2016   Hint: Substitute numbers so that x is an integer!

24. Given $x = \frac{4a+b}{3}$, which of the following expressions is equivalent to b ?

   F. $3x - 4a$

   G. $3x + 4a$

   H. $x - \frac{4a}{3}$

   J. $\frac{x}{3} - 4a$

   K. $\frac{x-4a}{3}$

ACT June 2017   Hint: What is the best value to choose for x?

37. For all real numbers x such that $x \neq 0$, $\frac{4}{5} + \frac{7}{x} = ?$

   A. $\frac{11}{5x}$

   B. $\frac{28}{5x}$

   C. $\frac{11}{5+x}$

   D. $\frac{7x+20}{5+x}$

   E. $\frac{4x+35}{5x}$

Answers: 4J, 24F, 37E

Substitute Numbers

ACT April 2016   Which answer is a big distractor here?

51. The volume of a right circular cone with radius r and height h is $\frac{1}{3}\pi r^2 h$, where r and h have the same unit of measure. Cones A and B are both right circular cones. The radius of Cone B is 2 times the radius of Cone A. Cone B's height is $\frac{1}{2}$ Cone A's height. Compared to the volume of Cone A, the volume of Cone B is:

A. the same.

B. $\frac{1}{2}$ as great.

C. $\frac{2}{3}$ as great.

D. 2 times as great.

E. 4 times as great.

ACT April 2016   Which exponent rule is being tested?

58. If x and a are positive rational numbers such that $x^{2a} = 3$, then $x^{6a} = ?$

   F. 6
   G. 9
   H. 12
   J. 18
   K. 27

Answers: 51D, 58K

Use Substitution with Ordered Pairs

Every time you see an ordered pair: Write (x, y) below the ordered pair. Then, substitute the x- and y-values into the equation.

ACT December 2016

Using the ordered pair $(-5, 6)$, substitute $x = -5$ and $y = 6$.

21. In the standard (x, y) coordinate plane, the graph of the line $3x - 4y = d$ passes through the point $(-5, 6)$. What is the value of d?

A. -39
B. -9
C. 2
D. 9
E. 38

ACT June 2016

45. Consider the transformation of the standard (x, y) coordinate plane that maps each point (x, y) to the point (kx, ky) for a certain positive constant, k. In particular, this transformation maps $(3, 9)$ to $(1, 3)$. This transformation maps $(9, 24)$ to which of the following points?

A. $(3, 8)$
B. $(6, 21)$
C. $(7, 18)$
D. $(11, 30)$
E. $(27, 72)$

ACT June 2017

19. Which of the following ordered pairs in the standard (x, y) coordinate plane satisfies the system of inequalities below?

$$x > 2$$
$$y > 0$$
$$x + y < 5$$

A. $(1, 3)$
B. $(2, 2)$
C. $(3, 1)$
D. $(3, 2)$
E. $(4, 0)$

ACT June 2016

17. A function g is defined as $g(x, y, z) = 4xy - 3xz^2$. What is $g(2, 4, -3)$?

A. -22
B. -4
C. 8
D. 68
E. 86

Answers: 21A, 45A, 19C, 17A

Use Substitution with Ordered Pairs

ACT December 2016

18. In the standard (x,y) coordinate plane, the line represented by which of the following equations goes through $(0,7)$ and is parallel to the line represented by $y = -2x - 4$?

F. $y = -2x - 7$

G. $y = -2x + 7$

H. $y = \frac{1}{2}x - 7$

J. $y = \frac{1}{2}x + 7$

K. $y = 7x - 4$

ACT December 2016

23. In the standard (x,y) coordinate plane, a translation maps a point (x,y) to its image $(x - 5, y + 3)$. To what image does this translation map $(-3,-2)$?

A. $(-8,-5)$
B. $(-8, 1)$
C. $(-2, 1)$
D. $(2,-5)$
E. $(2, 1)$

ACT June 2014

50. In the standard (x,y) coordinate plane, line a contains the points $(-4,2)$ and $(-1,-3)$, and line b contains the points $(3,0)$ and $(7,0)$. At what point does line a intersect line b ?

F. $\left(-\frac{14}{5},\ 0\right)$

G. $\left(\frac{107}{35}, \frac{3}{7}\right)$

H. $\left(0, -\frac{14}{3}\right)$

J. $\left(3, -\frac{29}{3}\right)$

K. $\left(7, -\frac{49}{3}\right)$

ACT December 2016

23. In the standard (x,y) coordinate plane, a translation maps a point (x,y) to its image $(x - 5, y + 3)$. To what image does this translation map $(-3,-2)$?

A. $(-8,-5)$
B. $(-8, 1)$
C. $(-2, 1)$
D. $(2,-5)$
E. $(2, 1)$

Answers: 18G, 23B, 50F, 23B