THE BEST ACT PREP COURSE EVER

WORD PROBLEMS

ACT Math: Problem Set

1. The integer x is 5 more than positive integer y. The integer z is 3 less than b. The product of x and z is 36. What one of the answer choices could be b?

A. 15
B. 21
C. 7
D. 12
E. 8

2. The square root of some positive integer is n. What expression gives the square root of next integer greater than the first integer?

A. $\sqrt{(n^2+1)}$
B. $\sqrt{n+1}$
C. n^2+1
D. $n+1$
E. $(n+1)^2$

3. The smaller of two numbers is 12 less than one third of the larger number. Three times the larger number plus twice the smaller is 152. What is the correct expression for the smaller number, s?

A. $2s^2+3$
B. $9(s+12)+2s=152$
C. $5s+12=152$
D. $3s+12=152$
E. $9(s-12)+2s=152$

4. Each side of a square is s inches long. If the length is doubled and the width is increased by 3, what is the area of the rectangle that is formed?

A. $2s^2+3$
B. $(2s+3)^2$
C. $2s^2+6$
D. $2s^2+6s$
E. $6s^2$

5. A rectangle has length $n+2$ and width $n-3$. If a square with side $n-1$ is removed from the rectangle, what is the area?

A. $n-5$
B. $-2n-7$
C. $n-7$
D. n^2-2n-4
E. $(n-1)^2$

6. Ricky is buying pieces of colored cloth to build a costume. For the costume, he needs 7 10-inch pieces of red cloth, 4 14-inch pieces of blue cloth, and 3 19-inch pieces of black cloth. The cloth costs $\$0.83$ per *yard* regardless of color. If Ricky has no coins, how many dollars will he need to bring to pay?

A. $\$3$
B. $\$4$
C. $\$5$
D. $\$6$
E. $\$7$

7. A clothing store surveyed 125 of its customers about what articles of clothing they had bought from the store. Of the 125 customers, 104 had bought T-shirts, 74 had bought jeans, and 63 had bought both. Some customers bought neither. Of the 125 customers, how many had bought T-shirts, jeans, or both?

A. 178
B. 115
C. 62
D. 52
E. 10

8. Jemaine is a fruit farmer and he sells apples for $\$0.17$ per pound. He recently sold a shipment of apples for $\$300$. On average there are 3 apples per pound. Which value is closest to the number of apples in the shipment?

A. 300
B. $5{,}300$
C. $6{,}000$
D. $50{,}000$
E. $3{,}000$

9. Vijay has 89 marbles that are blue, green, or white. He spread them out on the floor and sees that there are three times as many blue marbles as white marbles and 16 fewer green marbles than white marbles. What is the difference between the amount of blue marbles and green marbles than Vijay has?

A. 21
B. 5
C. 16
D. 58
E. 42

10. At a racetrack, motorcyclists start with 50 points. Each racer gains 15 points for every lap of the track in 1 minute or under and loses 10 points for every lap over 1 minute. Marco finishes 12 more laps in 1 minute or under than he does in more than 1 minute. He ends with 320 points. How many laps did Marco finish in over 1 minute?

A. 12
B. 14
C. 16
D. 18
E. 20

11. A schoolteacher rewards good students with gummy bears. He has an initial amount x of gummy bears. He gives $\frac{1}{4}$ of the gummy bearsto the first student. Then he gives $\frac{1}{4}$ of the remaining gummy bears to the next student. He repeats this process one more time. If the teacher only gave out whole gummy bears, what is the minimum number of gummy bears he could have started with?

A. 4
B. 16
C. 64
D. 124
E. 256

12. If 7 times a number q is subtracted from 28, the result is negative. Which of the following gives the possible value(s) for q?

A. 0 only
B. 4 only
C. 12 only
D. All $q < 4$
E. All $q > 4$

13. Which of the following actions will produce the smallest result when replacing the blank in the expression $23\_\_\_\_\_(-\frac{3}{25})$?

A. multiplied by
B. divided by
C. minus
D. plus
E. to the power of

14. If the statement "If it is Thursday, then the café is closed" were true, which of the following statements would also have to be true?

A. "If the café is closed, then it is Thursday."
B. "If the café is not closed, then it is Thursday."
C. "If the café is not closed, then it is not Thursday."
D. "If it is not Thursday, then the café is closed."
E. "If it is not Thursday, then the café is not closed."

15. Adam told Candice that if he spent $\$70$ from his savings account, his saving account would have at least $\frac{4}{5}$ as much in it as it has now without spending. From Adam's statement, Candice can deduce that the *least* amount of money that Adam could have in his savings account now is:

A. $350
B. $87.50
C. $56
D. $280
E. $375

16. Mr. Lee is a teacher whose salary is $\$25{,}650$ for the school year, which has 195 days. In Mr. Lee's school district, substitute teachers are paid $\$85$ per day. If Mr. Lee takes two days off without pay and a substitute teacher is paid to teach Mr. Lee's classes, how much less does the school district pay in salary by paying a substitute teacher instead of paying Mr. Lee for those days?

A. $\$29.45$
B. $\$46.54$
C. $\$93.08$
D. $\$107.30$
E. $\$9{,}075.00$

17. Consider the 3 statements below to be true.

- No mammals are squirrels.
- Some mammals are bats.
- Some bats are squirrels.

Which of the following statements *must* be true?

A. All squirrels are bats.
B. All bats are mammals.
C. Some squirrels are not bats.
D. Some bats are not mammals.
E. Some mammals are squirrels.

18. Two scientists are running an experiment to produce a solid that can be used for further experimentation. The formula says that of the total solid formed, S, the usable amount, U, can be calculated by subtracting three-fourths the amount of Nitrogen, N, used in the experiment from 25% of the total solid formed. What equation gives the amount of usable solid?

A. $U = \frac{1}{4}S - \frac{3}{4}N$
B. $U = \frac{3}{4}N - \frac{1}{4}S$
C. $U = \frac{3}{4}S - \frac{1}{4}N$
D. $U = \frac{1}{4}N - \frac{3}{4}S$
E. $U = \frac{1}{4}S + \frac{3}{4}N$

19. For every 3 cents the price of a pound of bananas increases, a farmer sells 120 fewer pounds of bananas. If the farmer normally sells 5000 pounds of bananas, what expression models the number of pounds of bananas he sells if the price increases by an amount of c cents?

A. $5000 - 120c$
B. $5000 - 40c$
C. $5000 - c$
D. $5000 + 120c$
E. $5000 + 40c$

20. What rational number is one third of the way from $\frac{2}{5}$ to $\frac{6}{7}$?

A. $\frac{58}{105}$
B. $\frac{116}{105}$
C. $\frac{2}{3}$
D. $\frac{16}{115}$
E. $\frac{3}{5}$

ANSWERS

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

ANSWER EXPLANATIONS

1. C. y is a positive integer and $x = 5 + y$ so $x \geq 6$. Z is 3 less than b, so $z = b - 3$ or $b = z + 3$ The product of x and z is 36 so $x \times z = 36$. Since we know that 36 is positive and $x \geq 6$ then we can narrow down the values of x and z. Representing the values of x and z as an ordered pair the possible values are $(6,6)$, $(9,4)$, $(12,3)$, and $(36,1)$. So, the values of z are 6, 4, 3, and 1. This means that the values of $b = z + 3$ could be $6 + 3 = 9$, $4 + 3 = 7$, $3 + 3 = 6$, or $1 + 3 = 4$. The only value that matches a possible value for b is answer choice C.

2. A. Let the positive integer be represented as x. Then, $n = \sqrt{x}$. So, $x = n^2$. The next integer greater than x is then equal to $n^2 + 1$ and the square root of that is $\sqrt{(n^2 + 1)}$.

3. B. Let s represent the small number and let l represent the larger number. We can make these two equations from the question: $s = \frac{1}{3}l - 12$ and $3l + 2s = 152$. Taking the first equation and multiplying both sides by 3, we get $3s = l - 36$. Adding 36 on both sides. We get $3s + 36 = l$. Now, substituting in $l = 3s + 36$ into the equation $3l + 2s = 152$ we get $3(3s + 36) + 2s = 152$. Factoring out a 3 from the expression in the parenthesis, we get $9(s + 12) + 2s = 152$.

4. D. The new length is $2s$ and the new width is $s + 3$, so the new area is $A = width * length \rightarrow 2s(s + 3)$. Distributing the $2s$ we get $A = 2s^2 + 6s$.

5. C. The area of the original rectangle is $(n + 2)(n - 3) = n^2 + 2n - 3n - 6 = n^2 - n - 6$. The area of the square is $(n - 1)(n - 1) = n^2 - n - n + 1 = n^2 - 2n + 1$. So, the area remaining after subtracting the square from the rectangle is $n^2 - n - 6 - (n^2 - 2n + 1) = -n - 6 + 2n - 1 = n - 7$.

6. C. One yard is equal to 3 feet, which is equal to 36 inches, so Ricky will have to pay $\$0.83$ for every 36 inches. He need a total of inches of cloth. That means he must pay $183\ inches * \frac{\$0.83}{36\ inches} = 4.22$. Rounding this up, we get $\$5$.

7. B. If 63 customers had bought both and 74 had bought jeans, then $74 - 63 = 11$ had bought only jeans. If 104 had bought shirts, then $104 - 63 = 41$ had bought only shirts. This counts for a total of $63 + 11 + 41 = 115$ customers who bought a shirt, jeans, or both.

8. B. $\$300 * \frac{1\ pound}{\$0.17} * \frac{3\ apples}{1\ pound} = 5294.12$ apples. The closest answer choice value is 5300 apples.

9. D. Let b = the number of blue marbles, g = the number of green marbles, and w = the number of white marbles. There are a total of 89 marbles, so $b + g + w = 89$. There are 3 times as many blue marbles as white marbles, so $b = 3w$. There are 16 fewer green marbles than white marbles, so $g = w - 16$. Substituting $b = 3w$ and $g = w - 16$ in the equation $b + g + w = 89$, we get $3w + w - 16 + w = 89$. Simplifying and solving for we get $5w - 16 = 89 \rightarrow 5w = 105 \rightarrow w = 21$. Plugging in this value for we can solve for the values of b and g. $b = 3w = 3(21) \rightarrow = 63$. $g = w - 16 \rightarrow 21 - 16 = 5$. So, the difference between the amount of blue marbles and green marbles is $b - g = 63 - 5 \rightarrow 58$.

10. D. Let m = the number of laps he finishes in more than 1 minute. Then the number of laps he finished in less than or equal to 1 minute is 12 more than m and can be represented as $m+12$. Then, the number of points he gets from laps finished over 1 minute is equal to $-10m$ and the number of points he gets from laps finished under 1 minute is equal to $15(12+m)$. The total points he gets for all his laps is then $15(12+m)-10m$. Every racer starts with 50 points and we are given that he ends with 320 points, so $50+15(12+m)-10m=320$. Simplifying and solving for m, we get $50+15(12+m)-10m=320 \rightarrow 50+180+15m-10m=320 \rightarrow 230+5m=320 \rightarrow 5m=90 \rightarrow m=18$.

11. C. Starting with x gummy bears, the teacher gives out $\frac{1}{4}x$ to the first student, which means that he is left with $x-\frac{1}{4}x=\frac{3}{4}x$ gummy bears. Of these $\frac{3}{4}x$ gummy bears, he gives away $\frac{1}{4}*\frac{3}{4}x=\frac{3}{16}x$ gummy bears to the second student, so he is left with $\frac{3}{4}x-\frac{3}{16}x \rightarrow \frac{12}{16}x-\frac{3}{16}x \rightarrow \frac{9}{16}x$. Of these $\frac{9}{16}x$ gummy bears, he gives away $=\frac{1}{4}x*\frac{9}{16}x \rightarrow \frac{9}{64}x$ of these gummy bears to the last student. He is then left with $\frac{9}{16}x-\frac{9}{64}x \rightarrow \frac{36}{64}x-\frac{9}{64}x=\frac{27}{64}x$ gummy bears. The smallest number x that will make $\frac{27}{64}x$ a whole number is $x=64$.

12. E. Writing out the given information into an equation, we have $28-7q<0$. We add the q term to the other side and divide by $7: 28<7q \rightarrow 4<q$, which is the same as $q>4$.

13. B. We can eliminate answer choices C, D, and E because these all give us positive values when the operation is performed. Only choices A and B yield negative results. $23*(-\frac{3}{25})=-\frac{23\times3}{25}\approx-3$ while $\frac{23}{-\frac{3}{25}}=23*(-\frac{25}{3})\approx-125$. So, we can see that by roughly estimating 23 as 25, we can already see that the result reached by dividing is much smaller than the result reached by multiplying.

14. C. The statement "If it is Thursday, then the Café is closed" is in the form "If p then q" where p=the event it is Thursday and q = the event the café is closed. If the statement is true, then the contrapositive "If not q then not p" is also true. This is the statement "If the café is not closed, then it is not Thursday".

15. A. If we assume that his savings account has $\frac{4}{5}$ as much as what he has now after spending $\$70$, then we can calculate the amount of money in his savings account now as $\frac{4}{5}s=s-70$ so $s=7*50=350$. This is the least amount of money he could have in his savings account to spend $\$70$ and $\frac{4}{5}$ or more of his savings remain. If he had more money saved, he would save a greater portion of his savings, but if he had less than $\$350$, $\$70$ would be more than $\frac{1}{5}$ of his savings, and this he would have less than $\frac{4}{5}$ remaining.

16. C. Mr. Lee earns $\$25{,}650$ over 195 days, which means the school district pays him $\frac{25{,}650}{195}=\$131.54$ per day. If Mr. Lee takes two days off without pay and the school district pays substitute $\$85$ a day for two days to cover Mr. Lee, then the school district saves $\$131.54*2-\$85*2=\$93.08$ for those two days.

17. D. These types of logic puzzles can be difficult, so we should try to draw a diagram. First, draw a circle that represents squirrels. Our first statement is that "all mammals are not squirrels". Draw two separate circles to represent squirrels and mammals. The next statement, "some mammals are bats" means that we can intersect a circle called bats with mammals. The next statement, "some bats are squirrels" means we can also intersect the bats circle with squirrels. Note that even though there may be space in our diagram where the bats circle doesn't intersect with mammals or squirrels, this is not necessarily true of bats themselves. We do not know if there are bats that are neither mammals nor squirrels. We do know, from looking at the diagram, that there are some bats that are not mammals (those that are in squirrels) and vice versa. Thus, (D) is true.

18. A. 25% of the total solid formed is equal to $\frac{1}{4}S$. Subtracting $\frac{3}{4}$ of the amount of Nitrogen N from this, we get $\frac{1}{4}S-\frac{3}{4}N$. So, $U=\frac{1}{4}S-\frac{3}{4}N$.

19. B. For every 3 cents the price increases, the farmer sells 120 fewer pounds of bananas. So, if he sells the price at c cents higher, that is $\frac{c}{3}$ times the farmer will sells 120 fewer pounds. So, he will sell $\frac{c}{3}(120)=40c$ fewer pounds than his usual 5000 pounds. This means he will sell $5000-40c$ pounds of bananas if he increases the price by c cents.

20. A. We first write $\frac{2}{5}$ and $\frac{6}{7}$ with the same denominator. Making the denominator the greatest common multiple $5(7)=35$ we get $\frac{2}{5}*\frac{7}{7}=\frac{14}{35}$ and $\frac{6}{7}*\frac{5}{5}=\frac{30}{35}$. The difference between these two fractions can then be easily calculated as $\frac{30}{35}-\frac{14}{35}=\frac{16}{35}$. One third of this difference is $\frac{1}{3}*\frac{16}{35}=\frac{16}{105}$. So, the number that is one third of the way from $\frac{2}{5}$ to $\frac{6}{7}$ is $\frac{2}{5}+\frac{16}{105}\rightarrow\frac{14}{35}+\frac{16}{105}\rightarrow$ $\frac{42}{105}+\frac{16}{105}=\frac{58}{105}$.