Test Prep Champions Presents:

The Champions' Guide to Winning

On the 2017 GED® Test Math Section

From Test Prep Champions

Free Sample Version

www.testprepchampions.com

Contents:

Disclaimer

Author's Note:

This free sample is from an early draft of *The Champions' Guide to Winning On the 2017 GED® Test Math Section From Test Prep Champions*, and while the problems and solutions contained in it are overall an accurate representation of those in the complete version, they may differ slightly.

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Introduction

Thank you for purchasing *The Champions' Guide to Winning On the 2017 GED® Test Math Section From Test Prep Champions!* Congratulations on your decision to pursue completion of the GED® Test! This book has been over 8 months in the making, and I am very excited to finally share it with you! Before we jump in, please allow me to briefly introduce myself: my name is Parker Smith. I have successfully tutored and mentored over 70 students at both the high school and university levels since 2011, and have seen many of them achieve their dreams. I have been involved specifically with preparing students for the GED® test for nearly two years now, and have learned a tremendous amount from my experiences. I've spent many hours meticulously striving to improve my methods using a trial and error approach, consultation with other tutors and teachers, attending workshops and trainings, and lots of research into how we learn and process information.

This book was designed with the exclusive purpose of helping all students taking the GED® test to excel with the math section! It includes 209 comprehensive practice problems with in-depth solutions that cover virtually everything you'll need to know to succeed on the exam, multiple times, and in multiple ways! Why do we say this work covers *virtually* everything you need to know for the test? The truth is that it would be impossible for any test preparation guide to cover every single conceivable variation and scenario that could possibly show up on the exam. However, if you put forth the effort to understand every problem and solution in this book and to master everything we have to teach you, you should be in excellent shape to excel on the real exam!

After passing the test, you can find many opportunities to advance in your career and professional life, and to earn more money. Regardless of where you believe you're at right now with your preparation, we are confident that you will find this book very helpful! If you've been away from formal education for a while, or feel you're weak in math fundamentals, don't worry! I've worked with many former students who had been away from formal education for many years before beginning their test preparation. While most of them had initially forgotten much of what they'd learned in school, they still went on to be very successful! As long as you're willing to put the work in, you'll improve quickly with the practice you'll get through completing this book!

One element of this book that makes it unique compared to other works is the extremely detailed solutions! The majority of our explanations teach you not just how to get each problem right, but they also explain the topics so that you'll be able to get similar questions right in the future! For example, for a question involving addition with fractions, we don't just teach you how to answer that question, we go a step further and provide you with a mini-lesson on the topic of adding fractions so that you'll be set for similar future problems!

Perhaps you've already been studying for a while now. Maybe you've tried other materials, or maybe you've even taken the test already without success. Great success is often accompanied by some temporary setbacks, so don't give up! The number one complaint we've heard from numerous students who have taken the test is that they found it much harder than the practice materials they used. Our problems are very challenging, but if you really push yourself, you may end up surpassing even your own expectations!

Wouldn't it be an awesome feeling to accomplish your goal of succeeding on the GED® test? All the students we've known who passed said afterwards that it was one of the most profound and rewarding experiences of their lives. One student passed the GED® test, enrolled at a community college, and then eventually transferred to his dream university after lots of hard work. Other students have pursued their CDLs to become truck drivers, and others still have pursued careers in nursing after completing the test. The options are virtually limitless, and it can all start here for you! Once you finish, you'll have your own success story to tell! For best results, we recommend that you repeat these problems at least 2 - 3 times, because the extra repetitions will help everything stick. You may find it helpful to take lots of notes as you go. The best advice we can give you is to not take it personally if you come across problems you aren't sure how to do, but to instead view these problems as a challenge to learn from and conquer. As we've said before, these problems are meant to be hard! But so is the real test, so it's best to be ready for anything! Also, please be aware that while these questions are all multiple choice, the questions on the real exam will be given to you in a variety of different formats. If you can master the material we have to teach you, and if you can apply it to new situations, you should be able to handle any questions presented regardless of the format!

I don't know if as you sit there, following along, you can just stop and picture yourself after you've aced the GED® test or not, but if you could, what would it be like? Would you be calm, fearless, and triumphant, looking back with a feeling of freedom on the moment you decided to finally let go of all hesitations and doubts to really go for it? Perhaps you'd find that you already have everything you need to succeed with you right here, right now. Have faith in yourself and your abilities, because you can surely accomplish your goal of succeeding on the test with some hard work and practice! As you work through this book, don't hesitate to reach out to us if you have any questions! We are here for you, and we want to see you win! While we cannot guarantee your success, because your success is ultimately up to you, we can provide you with a comprehensive method to get there, which is what you'll find in this book. Thanks again for choosing our guide! We wish everyone the best of luck!

Thank you,

Test Prep Champions

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Questions?

You can get in touch with us our website's contact page, or by emailing us at testprepchampions@gmail.com.

Before beginning, please be aware that you will be given the formulas you'll need to know on your test when you go to take it; you won't be responsible for memorizing them! Most of the formulas that you'll need to be able to apply can be found at www.math.com/tables/tables.htm (which we have no affiliation with), if you'd like to reference them while you work!

Problems

1. Determine the mean, median, mode, and range for the following dataset: 3, 7, 4, 2, 3

   A. 3.8, 4, 3, 5
   B. 11, 4, 3, 1
   C. 3.8, 3, 3, 5
   D. 3, 3.8, 3, 4
   E. 2.3, 2, 3, 5

2. What is 60% of 250?

   A. 175
   B. 50
   C. 150
   D. 90
   E. 55

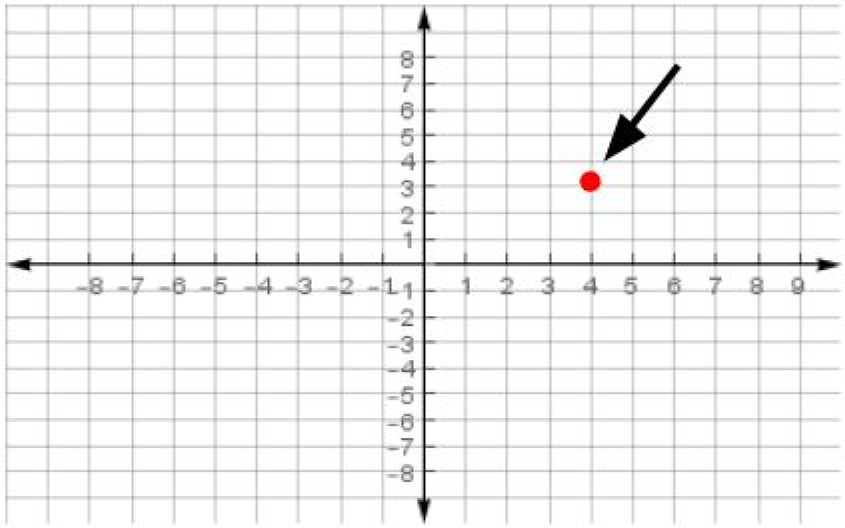
3. Which of the following is false?

   A. $\frac{1}{4} = .25$
   B. $\frac{2}{4} = .50$
   C. $\frac{3}{4} = .75$
   D. $\frac{4}{4} = 1.00$
   E. None. All of the above are true.

4. If $6 + x = 30$, what is the value of x?

   A. 32
   B. 23
   C. 24
   D. 94
   E. None of the above are correct

5. What are the coordinates of the point marked by the red dot on the graph below?

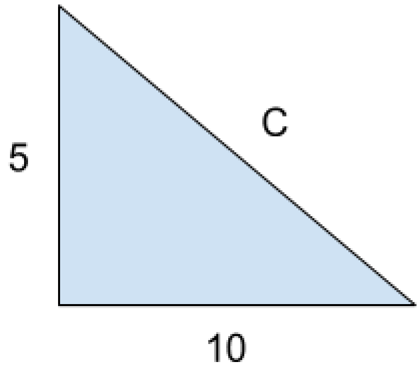


A. (4, 7)
B. (-4, 3)
C. (-4, 4)
D. (4, 3)
E. (8, 2)

6. Which of the following is false?

A. $4^5 \text{ x } 4^3 = 4^8$
B. $5^{10} \div 5^6 = 5^4$
C. $999^0 = 0$
D. $999^1 = 999$
E. $4^5 \text{ x } 4^5 = (4 \text{ x } 4)^5$

7. What is the value of side C for this triangle?



A. $\sqrt{125}$
B. 60
C. 125
D. $\sqrt{60}$
E. None of the above are correct

8. Which of the following is false?
A. $12 > 4$ is read as "12 is greater than 4"
B. $88 \neq 9$ is read as "88 is not equal to 9"
C. $6 < 9$ is read as "6 is less than 9"
D. $100 = 100$ is read as "100 is equal to 100"
E. None of the above

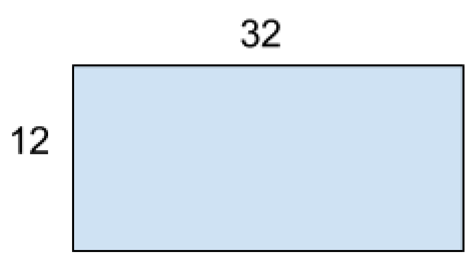
9. Answer without using a calculator: $563 + 124 = ?$
A. 549
B. 728
C. 687
D. 980
E. 899

10. The table below shows the test scores for 5 students. What is the average test score?

Student	**Test Score**
Jamie	88
Malcom	98
Katie	72
David	85
Sarah	92

A. 79
B. 87
C. 92
D. 84
E. None of the above

11. Find the area and perimeter for the rectangle.



A. 384, 88
B. 88, 384
C. 126, 24
D. 24, 126
E. None of the above are correct

12. Without using a calculator, determine which number below is equal to the fraction $\frac{7}{4}$.

A. .75
B. 1.75
C. 1.65
D. 1.53
E. 2.50

13. Betty has a lemonade stand, and sells lemonade at a price of $1 per cup. Next month, Betty is planning to increase her selling price by fifty cents. What will the price be next month?

A. $7.00
B. $00.45
C. $1.50
D. $3.00
E. None of the above

14. $a^8 \text{ x } a^{17} = ?$

A. a^{136}
B. a^{13}
C. a^{25}
D. a^{817}
E. 0

15. 6 x -3 = ?

A. 18
B. 6
C. 3
D. -6
E. -18

16. John has entered into a contest in which a marble will be drawn from a jar with 100 marbles total. If John correctly guesses the color of the marble before it is drawn, he will win a prize. If the jar has 10 blue marbles, 15 green marbles, 30 yellow marbles, and 45 red marbles, which color should John guess to give him the best chance of winning?

A. Blue
B. Red
C. Yellow
D. Green
E. Each color has an equal chance of being drawn.

17. What is the slope of a straight line that contains the points (3, 12) and (8, 32)?

A. 10
B. $\frac{4}{3}$
C. $\frac{5}{8}$
D. 4
E. 23

18. In which of these pairs do both numbers round to 32.75?

A. 32.747, 32.740
B. 32.749, 32.743
C. 32.741, 32.748
D. 32.745, 32.749
E. 32.749, 32.740

19. Which answer choice represents the inequality graphed on the number line?

A. $x < -1$
B. $x \leq -1$

C. $x \geq -1$
D. $x > 1$
E. None of the above

20. $\frac{10}{20} + \frac{3}{30} = ?$
A. $\frac{3}{7}$
B. $\frac{3}{11}$
C. 55
D. $\frac{3}{5}$
E. 123

21. Answer without using a calculator: $63 - 12 = ?$
A. 34
B. 51
C. 43
D. 47
E. None of the above

22. *Ben's Burger Stop* provides it's customers with nutrition information about some of their food, as seen in the chart below.

Nutrition Information for *Ben's Burger Stop*
(Average values are provided)

Menu Item	Calories	Protein (grams)	Fat (grams)
Ben's Specialty Burger	415	38	21
Ben's Specialty Fries	360	4	19
Ben's Bacon Cheeseburger	504	44	29
Classic Cheeseburger	350	25	22
Classic Hamburger	320	23	20
Double Cheeseburger	706	53	43

Which menu item has the second lowest fat content?

A. Ben's Specialty Fries
B. Classic Cheeseburger
C. Double Cheeseburger
D. Classic Hamburger
E. Ben's Bacon Cheeseburger

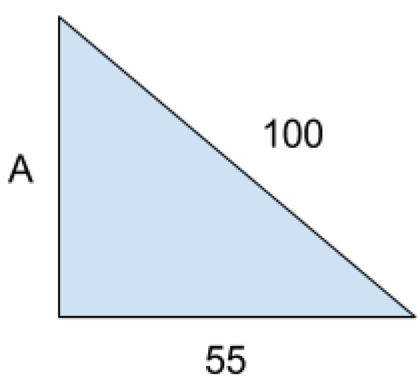
23. $\frac{10}{20} - \frac{3}{30} = ?$

A. $\frac{12}{53}$
B. $\frac{88}{89}$
C. $\frac{2}{5}$
D. $\frac{1}{4}$
E. None of the above

24. Which of the following is true?

A. $42 < 29$
B. $30 \neq 30$
C. $50 > 120$
D. $4 > 2$
E. $\$55.00 > \$255.00$

25. What is the value of side A for this triangle rounded to the nearest whole number?



A. 84

B. 23
C. 44.73
D. -24
E. 42

26. $\frac{10}{20} \times \frac{3}{30} = ?$
A. $\frac{1}{20}$
B. $\frac{44}{55}$
C. $\frac{3}{20}$
D. $\frac{1}{240}$
E. None of the above

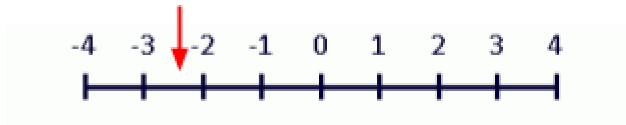
27. If $y = 17x - 9$, and x equals 4, what is the value of y?
A. 99
B. 59
C. 203
D. 47
E. 39

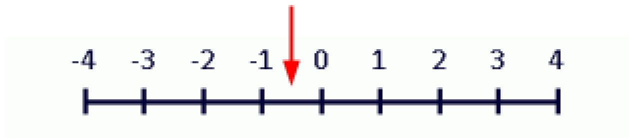
28. For which value of x is the expression $y = \frac{7x}{2-x}$ undefined?
A. 8
B. 10
C. 12
D. 2
E. None of the above

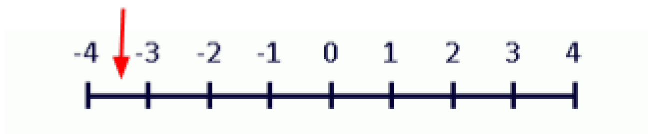
29. Approximately where on the number line is the fraction $-\frac{7}{3}$ found?

A. 

B. 

C. 

D. 

E. 

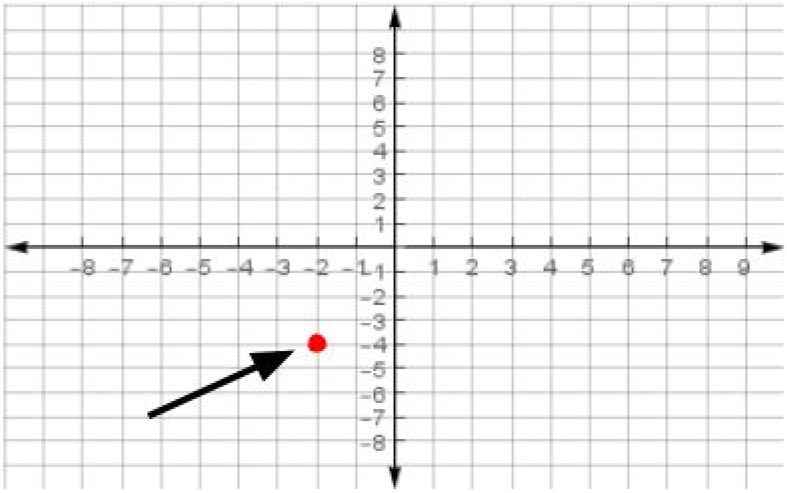
30. Answer without a calculator: $56 + 79 = ?$

A. 485
B. 101
C. 120
D. 299
E. 135

31. $\frac{10}{20} \div \frac{3}{30} = ?$

A. $\frac{1}{20}$
B. $\frac{44}{55}$
C. $\frac{4}{9}$
D. $\frac{5}{24}$
E. None of the above

32. What are the coordinates of the point marked by the red dot on the graph below?

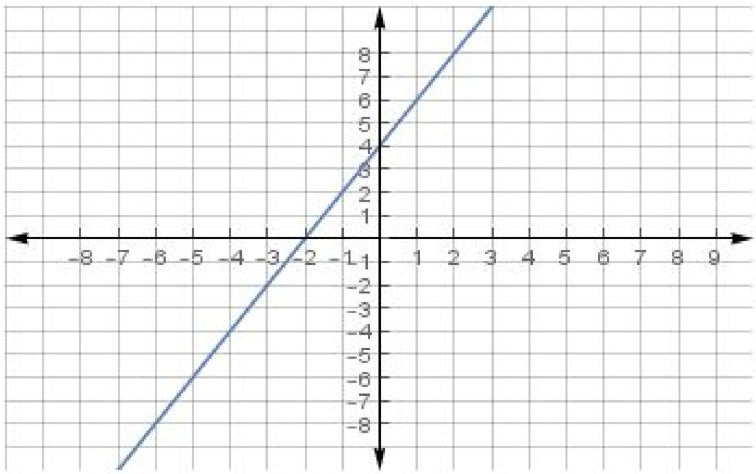


A. (2, 4)
B. (4, 1)
C. (-2, -4)
D. (-4, -2)
E. (2, 4)

33. $(16 - 5)^2 - 30\,x\,4 + 16 = ?$

A. 417
B. 380
C. 23
D. 99
E. 17

34. What is the slope of the line shown in the graph below?



A. 2
B. -6
C. 8
D. 44
E. None of the above

35. Answer without using a calculator: 222 x 11 = ?
A. 2002
B. 2442
C. 2902
D. 3029
E. None of the above

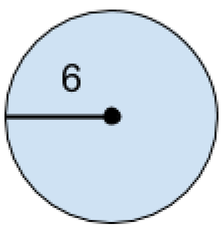
36. Which of the following is false?
A. A positive number multiplied by a positive number results in a positive number
B. A negative number multiplied by a positive number results in a negative number
C. A negative number multiplied by a negative number results in a positive number
D. A negative number multiplied by a negative number results in a negative number

E. None of the above are false

37. Solve for y: $\frac{16}{5} = \frac{12}{y}$

A. 3.75
B. 1.14
C. 3
D. 8
E. 2.50

38. Which of the following statements is false about this circle?



A. The radius of the circle is 6
B. The diameter of the circle is 6
C. The diameter of the circle is 12
D. The area of the circle is 36π
E. The circumference of the circle is 12π

39. Solve for x: $2x^2 - 5x - 12$.

A. $x = -4, x = \frac{3}{2}$
B. $x = 4, x = -\frac{3}{2}$
C. $x = -7, x = \frac{9}{11}$
D. $x = 7, x = -\frac{9}{11}$
E. None of the above

40. Which of the following is false?

A. $\sqrt{1} = 1$
B. $\sqrt{36} = 6$
C. $\sqrt{4} = 2$
D. $\sqrt{64} = 8$
E. All of the above are true

41. While shopping, John bought a new pair of shoes for $65.99, which were on sale for 60% of the original price. What was the original price of the pair of shoes rounded to the nearest whole number?

A. $119.00
B. $110.00
C. $134.00
D. $156.00
E. None of the above

42. What is the probability of Sally drawing a blue marble from a jar with 9 blue marbles, 7 red marbles, 1 yellow marble, and 10 green marbles?

A. $\frac{7}{9}$
B. $\frac{1}{4}$
C. $\frac{1}{3}$
D. $\frac{2}{5}$
E. None of the above

43. Consider (2x - 1)(3x + 11), how can the two binomials be distributed?

A. $4x^2 + 6x - 1$
B. $22x^2 - 19x + 34$
C. $16x^2 + 11x - 99$
D. $6x^2 + 19x - 11$
E. None of the above

44. Which of the following is false?

A. $\sqrt{a} = a^{\frac{1}{2}}$

B. $x^{-a} = \frac{1}{x^a}$
C. $b^{n^m} = b^{(n^m)}$
D. $\sqrt[5]{a} = a^5$
E. $x^{-33} = \frac{1}{x^{33}}$

45. How many inches are in 68 feet? There are 12 inches in 1 foot.
A. 720 in
B. 9022 in
C. 816 in
D. 88 in
E. None of the above

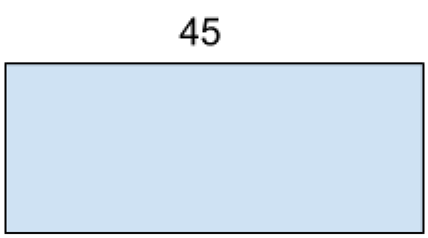
46. A high school classroom has 23 students, and 12 of them are boys. Which equation can be used to determine the number of girls?
A. 23 = x - 12
B. x = 23 + y + x - 12
C. 23 = x + 12
D. 23 = -7y + 3
E. None of the above

47. Which answer choice has 33.333, 17.777, 14.221, and 2.340 correctly rounded to the nearest tenths place?
A. 33.3, 17.8, 14.2, 2.3
B. 33.3, 17.7, 14.2, 2.4
C. 33.4, 17.8, 14.2, 2.3
D. 33.5, 17.8, 14.2, 2.3
E. 33.3, 17.8, 14.2, 2.4

48. What are the x and y values for the following system?
x - 12 = 4y
6x = 60y

A. $x = 20, y = 35$
B. $x = 20, y = 2$
C. $x = 13, y = 5$
D. $X = 35, y = 20$
E. None of the above

49. If the rectangle below has an area of 270 in^2, what is the perimeter?
A. 203 in
B. 102 in
C. 110 in
D. 105 in
E. 6 in



50. $3x^3 + 66x + 8 - x^3 + 44x + 123x^2 + 90 - 86x^2 + x = ?$
A. $33x^3 + 37x^2 + 1231x$
B. $37x^8 + 1000$
C. $x^3 + 30x^2 + 111x + 98$
D. $2x^3 + 37x^2 + 111x + 98$
E. $x^3 + 10x^2 + 11x$

Explanations

1. Answer: C

Explanation:

Finding the mean:

The mean is the average of all of the numbers in the dataset. To find the mean, we need to add up all of the numbers in the dataset:

→ 3 + 7 + 4 + 2 + 3 = 19.

Next, we need to divide the sum (the 19 we just found) by the total number of numbers in the dataset, which is 5:

$$\rightarrow \frac{19}{5} = 3.8$$

Now that we know the mean is 3.8, we can eliminate answer choices B, D, and E, leaving us with only A and C as possibilities.

Finding the median:

The median is the middle number in the dataset when the numbers are ordered from smallest to largest. To find the median, we must start by reordering the numbers from smallest to largest, which gives us:

→ 2, 3, 3, 4, 7.

Since 3 is the number in the middle, we know that 3 is the median. We can now eliminate answer A, leaving us with C, which is the correct answer.

Q: Why is answer choice A wrong?

Without reordering the numbers in the dataset from smallest to largest, 4 looks like it might be the median. However, we must ALWAYS reorder the numbers from smallest to largest first to find the median! If you chose answer choice A, you had the right idea, but be aware that this is a common trap used by test writers!

Even though we now know the answer is C, let's quickly review how to find the mode and the range.

Finding the mode:
The mode is the *most* occurring number in the dataset. To find the mode, simply identify the number that shows up the most. Here, we have two 3s, but only one of each of the other numbers. Therefore, 3 is the mode.

Finding the Range:
The range is determined by subtracting the lowest value in the dataset from the highest value in the dataset.

→ 7 - 2 = 5, so the range is 5!

*****Remember:**
The mean *means* the average
The me*d*ian is the mi*dd*le number (when the numbers are ordered from smallest to largest)
The m*o*de is the *most* occurring number
The range is the highest value minus the lowest value!

*****Common Mistake To Avoid:** Forgetting to reorder the numbers from smallest to largest! The most important thing to remember when finding the median is to always reorder the numbers from smallest to largest first! If we forget to do this, we will get the wrong answer!

2. Answer: C

Explanation:
For percent problems such as this one, we recommend that you use the formula provided below and simply plug the numbers in.

Formula for Solving Percent Problems:

$$\boxed{\frac{is}{of} = \frac{\%}{100}}$$

Q: How do I know which number to plug in for is, which number to plug in for of, and which number to plug in for %?

A: A good strategy is to first always identify what you need to find. Here, the question starts with "what is," so we can assume that the *is* term is our unknown, and we can represent it with *x*. Because the word *of* comes directly before 250 in the question, we know that 250 is the *of* term. For these types of questions, if the percent term is given, it can always be easily identified because it will be accompanied by a percent sign.

The answer can be obtained by plugging the numbers into the formula and using algebra to solve for the unknown:

$$\rightarrow \frac{x}{250} = \frac{60}{100} \rightarrow x = \frac{250 \cdot 60}{100} \rightarrow \quad x = \frac{15000}{100} \rightarrow x = 150$$

3. Answer: E

Explanation:

These answer choices are all true, and each one is important to remember! Note that in math, $\frac{1}{4}$ is called one quarter, $\frac{2}{4}$ is called 2 quarters, $\frac{3}{4}$ is called 3 quarters, etc…

The best way to remember this is to think about money:

If you have 1 quarter, you have 25 cents $\rightarrow$ $\frac{1}{4}$ = .25

If you have 2 quarters, you have 50 cents $\rightarrow$ $\frac{2}{4}$ = .50

If you have 3 quarters, you have 75 cents $\rightarrow$ $\frac{3}{4}$ = .75

If you have 4 quarters, you have 1 dollar $\rightarrow$ $\frac{4}{4}$ = 1.00

4. Answer: C

Explanation:

This is a standard type of algebra problem that you will DEFINITELY need to know how to solve for the exam! The goal here is to get the term *x* by itself on one side of the equation. The best way to do this is to subtract 6 from both sides. Remember, whatever you do to one side of the equation, you have to do to the other!

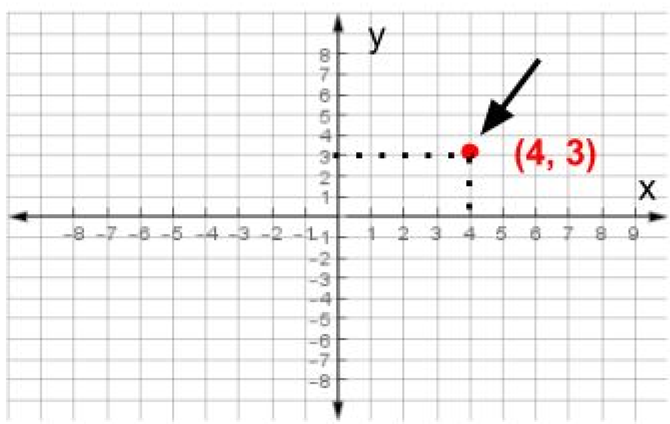
$6 + x = 30 \rightarrow x = 24$

-6 -6

Alternatively, you could plug each answer choice in for *x* until you find a value that equals 30!

5. Answer: D

<u>Explanation:</u>
This question is testing you on your ability to identify the coordinate pair of a point on a graph. This skill will be very important for many different kinds of problems! The vertical line is called the *y axis*, and the horizontal line is called the *x axis.* The trick is to look directly at the point, then first check which number it corresponds to on the x axis. This number will be written first in the coordinate pair. After you have the x coordinate, go back to the point and next check which number corresponds to it on the *y axis*. This point will be your y coordinate.



6. Answer: C

<u>Explanation:</u>
The question is testing you on your knowledge of some of the exponent rules in the table below. It is crucial to know these rules very well for the test! Countless students who have aced the math section have reported that mastering these rules was essential for excelling on the test. Thus, we call them the “essential” rules of exponents.

<u>Essential Exponent Rules To Know:</u>

Product Rules:	**Quotient Rules:**	**Power Rules:**

$a^n \cdot a^m = a^{n+m}$ $a^n \cdot b^n = (a \cdot b)^n$	$\frac{a^n}{a^m} = a^{n-m}$ $\frac{a^n}{b^n} = (\frac{a}{b})^n$	$(b^n)^m = b^{n \cdot m}$ $b^{n^m} = b^{(n^m)}$ $\sqrt[m]{b^n} = b^{\frac{n}{m}}$ $b^{\frac{1}{n}} = \sqrt[n]{b}$
Zero Rules:	**One Rules:**	**Negative Exponent Rules:**
$b^0 = 1$ $0^b = 0$ when $b > 0$	$b^1 = b$ $1^b = 1$	$b^{-n} = \frac{1}{b^n}$ $b^n = \frac{1}{b^{-n}}$

If this table doesn't make much sense to you right now, don't worry! The best way to master these rules is through practice.

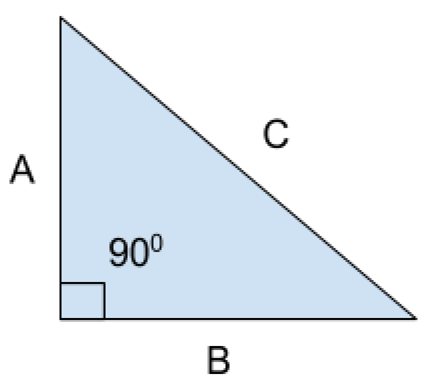
7. Answer: A

Explanation:

The triangle we've been given is a right triangle. A right triangle is a triangle that contains a 90^0 angle. Whenever we have a right triangle, we can apply the Pythagorean Theorem.

Pythagorean Theorem:

$A^2 + B^2 = C^2$



For this question A = 5 and B = 10. If we plug these values into the formula $A^2 + B^2 = C^2$, we can obtain the value of C:

$$\rightarrow (5)^2 + (10)^2 = C^2 \rightarrow 25 + 100 = C^2 \rightarrow 125 = C^2$$

If you chose answer choice C, you probably stopped at this step here. This is a common mistake students often make! We need to take the square root of both sides of the equation to obtain C:

$$\rightarrow \sqrt{125} = C$$

8. Answer: E

<u>Explanation:</u>

None of the above are false. This question is testing you on your knowledge of what some common math signs/symbols mean. The table below summarizes everything you need to know to get this question correct. Students often confuse the *greater than* and *less than* signs, so if you can just keep them straight, you'll be ahead of the game.

Math Sign/Symbol	Translation
=	Equal to
≠	Not equal to
>	Greater than
<	Less than

9. Answer: C

<u>Explanation:</u>

It is helpful to rewrite this problem so that the numbers line up in 3 columns:

$$\begin{array}{r} 563 \\ +124 \\ \hline \end{array}$$

We then want to add each column starting from the ones place (shown in blue) just like we would add any other whole numbers:

$$\begin{array}{r} 563 \\ +124 \\ \hline 7 \end{array}$$

After the ones place, we add the numbers in the tens place shown in red:

$$\begin{array}{r} 563 \\ +124 \\ \hline 87 \end{array}$$

We then finish by adding the numbers in the hundreds place, shown in purple:

$$\begin{array}{r} 563 \\ +124 \\ \hline 687 \end{array}$$

The answer is 687.

Note: You will be able to use a calculator for most of the exam, but not for all of it. Making sure you're able to do addition problems like this one by hand will be very important for your success on the test!

10. Answer: B

Explanation:

The *average/mean* is defined as the sum of all of the numbers in one list divided by the total number of terms in a corresponding list. Here, the sum of all of the numbers in the list is the sum of the test scores, and the total number of terms in the corresponding list is the total number of students. To find the average of the test scores, first add up all of the test scores:

$\rightarrow 88 + 98 + 72 + 85 + 92 = 435$

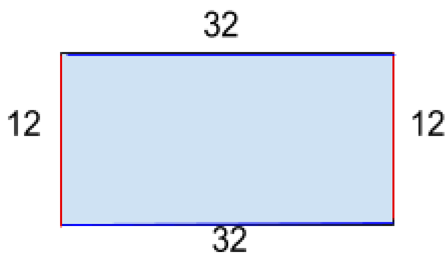
Next, identify the number of students (here it's 5), then divide 435 by 5 to get the answer:

$\rightarrow \frac{435}{5} = 87$

11. Answer: A

Explanation:

A rectangle has 2 sets of sides of equal length that are across from each other. Below is what the rectangle looks like with all of the sides labeled.



The area and perimeter can be calculated using these two formulas:

Area of a Rectangle:

$$\boxed{\mathbf{A_{rec} = length \cdot width}}$$

$\rightarrow$ 12 x 32 = 384

Perimeter of a Rectangle:

$$\boxed{\mathbf{P_{rec} = 2 \cdot length + 2 \cdot width}}$$

$\rightarrow$ 2 x 12 + 2 x 32 $\rightarrow$ 24 + 64 $\rightarrow$ 88

12. Answer: B

Explanation:

Let's review the basics for working with fractions.

The number on top (7 in this case) is called the numerator, while the number on the bottom (4 in this case) is called the denominator. One way to keep this straight that many students find helpful is to remember that the *d*enominator is "*d*ownstairs," or in the "*d*ungeon." There are 3 different types of fractions to know:

Proper Fractions: Fractions where the numerator is smaller than the denominator. These are "standard" fractions.

Ex: $\frac{4}{7}$, $\frac{2}{3}$, $\frac{3}{4}$

Improper Fractions: Fractions where the numerator is larger than the denominator. This is what we were given in this question.

Ex: $\frac{7}{4}$, $\frac{3}{2}$, $\frac{4}{3}$

Mixed Fractions: Mixed fractions (also called mixed numbers) are fractions that consist of both a whole number, and a proper fraction.

Ex: $2\frac{1}{3}$, $3\frac{1}{4}$, $5\frac{3}{4}$

Being able to convert between improper fractions and mixed numbers quickly is another crucial skill to master! To convert $\frac{7}{4}$ to a mixed number, the question we want to ask is: *4 multiplied by what number gives us a number close to, but less than 7?* Let's try 2:

→ 4 x 2 = 8.

2 won't work because 8 is greater than 7. Let's try 1 instead:

→ 4 x 1 = 4

1 works because 4 is less than 7! We now want to ask: *4 plus what number gives us 7?* We can use subtraction to figure this out:

→ 7 - 4 = 3, so 3 + 4 must give us 7.

We now have all of the information we need to write the mixed number. The denominator of the mixed number will be the same number as the denominator of the improper fraction, so 4 is the denominator of the mixed number. The whole number is the number we multiply the denominator by, so our whole number here is 1. Lastly, the numerator is the number we had to add to 4 to get 7, so 3 is our numerator here. Putting this together, we now know that $\frac{7}{4}$ written as a mixed number is $1\frac{3}{4}$:

→ $\frac{7}{4}$ → $1\frac{3}{4}$

Q: All of the answer choices are in decimal form, so how do we know which one is correct?

A: We can quickly figure out what $1\frac{3}{4}$ equals in decimal form by remembering that $\frac{3}{4}$ = .75. From this, it follows that answer A, 1.75, is the correct answer.

*****Remember:** $\frac{1}{4}$ = .25, $\frac{2}{4}$ = .50, $\frac{3}{4}$ = .75, and $\frac{4}{4}$ = 1.00

The best way to remember this is to think about money:

If you have 1 quarter, you have 25 cents → $\frac{1}{4} = .25$

If you have 2 quarters, you have 50 cents → $\frac{2}{4} = .50$

If you have 3 quarters, you have 75 cents → $\frac{3}{4} = .75$

If you have 4 quarters, you have 1 dollar → $\frac{4}{4} = 1.00$

***<u>**Alternatively:**</u>**
We know that $\frac{4}{4} = 1$, and that $\frac{8}{4} = 2$. Because $\frac{7}{4}$ is between $\frac{4}{4}$ and $\frac{8}{4}$, we can conclude that $\frac{7}{4}$ must be equal to a number between 1 and 2. Because $\frac{7}{4}$ is closer to $\frac{8}{4}$ than to $\frac{4}{4}$, we can conclude that $\frac{7}{4}$ must be equal to a value that is closer to 2 than 1. Because 1.75 is closer to 2 than to 1.05, we can conclude that A is the correct answer choice.

13. Answer C

<u>Explanation:</u>
We can eliminate answer B right away because it is less than the price she charged this month. To get the answer, we want to add the price of a cup this month and the amount she plans to increase it:

$\rightarrow \$1.00 + \$00.50 = \$1.50$

14. Answer: C

<u>Explanation:</u>
In this question, we have two terms with the same bases, a^{8} x a^{17} (highlighted in red), so we add the exponent terms (highlighted in blue) and keep the same base. Remember the product rules from our essential exponent rules table?

<u>Essential Exponent Rules:</u>

Product Rules:
$a^n \cdot a^m = a^{n+m}$ $a^n \cdot b^n = (a \cdot b)^n$

We have just applied the rule highlighted in red.

15. Answer: E

Explanation:

6 x 3 = 18, but because were are given negative 3, the answer is actually negative 18.

*****Key:** When a positive number is multiplied by a negative number, the answer will be a negative number.

16. Answer: B

Explanation:
The answer is D. If John guesses red, he will have the greatest chance of winning. If there are more red marbles in the jar than of any other color, it makes sense that the chance of drawing a red marble is greater than the chance of drawing any other colored marble. Whether you are aware of it or not, this question is testing your understanding of the concept of probability!

Probability Notes:

Definition of Probability: How likely an outcome is to occur.

Formula for the probability of an outcome occurring:

$$Probability\ of\ an\ outcome = \frac{The\ number\ of\ ways\ an\ outcome\ can\ occur}{The\ total\ number\ of\ outcomes\ that\ can\ occur}$$

If we apply the probability formula to each of the marble colors, we can confirm that the probability of drawing a red marble is the greatest:

$$Probability\ of\ drawing\ a\ blue\ marble = \frac{\#\ of\ blue\ \ marbles}{\#\ of\ marbles\ total} = \frac{10}{100} = .1$$

$$Probability\ of\ drawing\ a\ green\ marble = \frac{\#\ of\ green\ \ marbles}{\#\ of\ marbles\ total} = \frac{15}{100} = .15$$

$$Probability\ of\ drawing\ a\ yellow\ marble = \frac{\#\ of\ yellow\ \ marbles}{\#\ of\ marbles\ total} = \frac{30}{100} = .3$$

$$Probability\ of\ drawing\ a\ red\ marble = \frac{\#\ of\ red\ marbles}{\#\ of\ marbles\ total} = \frac{45}{100} = .45$$

17. Answer: D

Explanation:

First, let's make sure we're clear on the basics. (3, 12) represents the coordinates of one point on a line that we could graph. The first number given in a coordinate pair will always represent the x coordinate, and the second number will always represent the y coordinate.

Let's label the given coordinates like this:
(3, 12), (8, 32)
(x_1, y_1), (x_2, y_2)

Then, we can plug the numbers into the slope formula to get our answer.

Slope Formula:

$$\boxed{m = \frac{y_2 - y_1}{x_2 - x_1}}$$

Here's the calculation:

$$\rightarrow m = \frac{32 - 12}{8 - 3} \rightarrow m = \frac{20}{5} \rightarrow m = 4$$

18. Answer: D

Explanation:

The best strategy to use here is to go straight to the answer choices and use process of elimination. We need to round each number in each answer choice to the nearest hundredth until we find a pair in which each number rounds to 32.75.

The first number in answer choice A is 37.747.

Tenths place → 37.747
Hundredths place → 37.747
Thousandths place → 37.747

There is a 7 in the thousandths place, so we know that 37.747 will round to 32.75. So far so good. Note that any number in an answer choice with a 5 or a greater number in the thousandths place will round to 32.75!

The second number in answer choice A is 32.740.

Tenths place → 37.740
Hundredths place → 37.740
Thousandths place → 37.740

There is a 0 in the thousandths place, which tells us that 32.740 will round to 32.74. Answer choice A is wrong! Note that any number in an answer choice with a number less than 5 in the thousandths place will round to 32.74!

Continuing the analysis this way, we find that answer choice D is the correct answer!

19. Answer: C

Explanation:

An inequality is basically just a math statement that says that two numbers are not equal. The table below summarizes the information you need to know about the signs/symbols for this question.

Math Sign/Symbol	Translation
$>$	Greater than
$<$	Less than
$\geq$	Greater than or equal to
$\leq$	Less than or equal to

Note that the arrow begins at -1 on the number line, and continues past 8. The closed circle tells us that -1 is included in the range of values, and the line with the arrow tells us which values are included. Since no values less than -1 are included, A and B can be ruled out. Because -1 is included in the range, D can be ruled out, leaving us with C, which is the correct answer.

20. Answer D

<u>Explanation:</u>
We can start by simplifying each fraction. The first fraction can be simplified by dividing both 10 and 20 by 2:

$\rightarrow \frac{10}{20} \rightarrow \frac{1}{2}$

The second fraction can be simplified by dividing both 3 and 30 by 3:

$\rightarrow \frac{3}{30} \rightarrow \frac{1}{10}$

We can now rewrite the problem as $\frac{1}{2} + \frac{1}{10}$. Whenever we want to add two fractions, we always need to make sure there is a common denominator (the number on the bottom of the fraction). Because 2 is a factor of 10, we can get a common denominator by multiplying the top and bottom of the first fraction by 5:

$\rightarrow \frac{5\times1}{5\times2} + \frac{1}{10} \rightarrow \frac{5}{10} + \frac{1}{10}$

Now, we leave the denominator as 10 and add the numerators:

$\rightarrow \frac{5}{10} + \frac{1}{10} \rightarrow \frac{6}{10}$, simplify by dividing 6 and 10 by 2 $\rightarrow \frac{3}{5}$

21. Answer: B

<u>Explanation:</u>
It is helpful to start by rewriting this problem so that the numbers all line up in columns. We've highlighted the tens column in blue, and the hundreds column in red:

$$\begin{array}{r} 63 \\ -\ 12 \\ \hline \end{array}$$

The key for doing subtraction problems like this without a calculator is to pay very close attention to the top number, which here is 63. If both digits in the top number are bigger than the digits in the bottom number (the 12), then we can just subtract the numbers in the ones column first, then the numbers in the tens column, and then we're done!

$$\begin{array}{r} 63 \\ -\ 12 \\ \hline 51 \end{array}$$

The answer is 51.

22. Answer: D

Explanation:

Nutrition Information for *Ben's Burger Stop*
(Average values are provided)

Menu Item	Calories	Protein (grams)	Fat (grams)
Ben's Specialty Burger Ben's Specialty Fries Ben's Bacon Cheeseburger Classic Cheeseburger	415 360 504 350	38 4 44 25	21 19 29 22
Classic Hamburger	320	23	20
Double Cheeseburger	706	53	43

Since we're asked to find the item with the second lowest fat content, let's start by looking under the column labeled fat. Putting the numbers under the fat column in order, we get 19, 20, 21, 22, 43. We can see that 20 is the second lowest number, so we'll then need to see which menu item corresponds to 20 grams of fat. The classic hamburger is the correct answer.

23. Answer: C

Explanation:
We can start by simplifying each fraction. The first fraction can be simplified by dividing both 10 and 20 by 2:

$$\rightarrow \frac{10}{20} \rightarrow \frac{1}{2}$$

The second fraction can be simplified by dividing both 3 and 30 by 3:

$\rightarrow \frac{3}{30} \rightarrow \frac{1}{10}$

We can now rewrite the problem as $\frac{1}{2} - \frac{1}{10}$. Whenever we want to subtract two fractions, we always need to make sure there is a common denominator (the number on the bottom of the fraction). Because 2 is a factor of 10, we can get a common denominator by multiplying the top and bottom of the first fraction by 5:

$\rightarrow \frac{5\times1}{5\times2} - \frac{1}{10} \rightarrow \frac{5}{10} - \frac{1}{10}$

Now, we leave the denominator as 10 and subtract the numerators:

$\rightarrow \frac{5}{10} - \frac{1}{10} \rightarrow \frac{4}{10}$, simplify by dividing 4 and 10 by 2 $\rightarrow \frac{2}{5}$

24. Answer: D

Explanation:

From the math signs/symbols table, we know that the D is the correct answer.

Math Sign/Symbol	Translation
=	Equal to
≠	Not equal to
>	Greater than
<	Less than

*****Additional Practice Exercise:**

If you had trouble with this question, or want some extra practice, here's a good additional exercise to try if you would like: correct each false answer choice (A, B, D, and E). Try to do this first without using the math signs/symbols table, but if you get stuck, go ahead and try to figure them out using the table before you look at the answers!

*****Additional Practice Exercise:**

A $\rightarrow$ 42 > 29

B $\rightarrow$ 30 = 30

C $\rightarrow$ 50 < 120

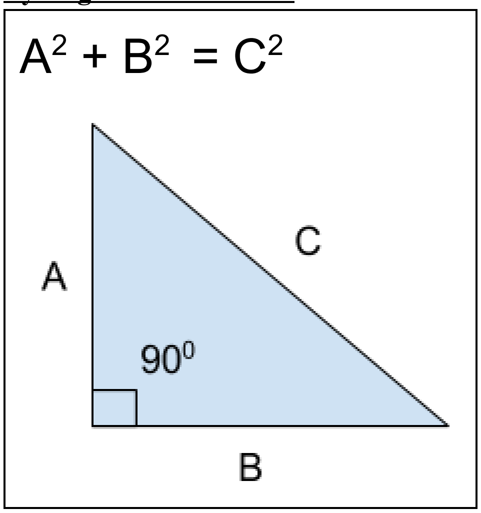
E $\rightarrow$ \$55.00 < \$255.00

25. Answer: A

Explanation:

Before we do any calculations, we can eliminate answer choice C, because it's not a whole number. The triangle we're given is a right triangle (a triangle containing a 90^0 angle), so we can apply the Pythagorean Theorem.

Pythagorean Theorem:



For this question B = 55, and C = 100. If we plug these values into the formula $A^2 + B^2 = C^2$, we can obtain the value of A:

$\rightarrow (A)^2 + (55)^2 = (100)^2 \rightarrow (A)^2 + 3025 = 10{,}000 \rightarrow A^2 = 6975$

We can eliminate answer choice D because we can't take the square root of a number and end up with a negative number.

$\rightarrow \sqrt{6975} =$ *approximately* 83.51 , which rounds to 84. Answer choice A is the correct answer.

26. Answer: A

Explanation:

We can start by simplifying each fraction. The first fraction can be simplified by dividing both 10 and 20 by 2:

$\rightarrow \frac{10}{20} \rightarrow \frac{1}{2}$

The second fraction can be simplified by dividing both 3 and 30 by 3:

$\rightarrow \frac{3}{30} \rightarrow \frac{1}{10}$

We can now rewrite the problem as $\frac{1}{2} \times \frac{1}{10}$. To multiply fractions, we just multiply the numerators and denominators:

$\rightarrow \frac{1}{2} \times \frac{1}{10} \rightarrow \frac{1}{20}$

27. Answer B

Explanation:

To answer this question, we need to substitute 4 into the equation for x. This is also called "plugging in" for x.

$\rightarrow y = 17(4) - 9 \rightarrow y = 68 - 9 \rightarrow y = 59$

28. Answer D

Explanation:

In mathematics, a number can never be divided by zero. If you want to test this, try dividing any number by zero on a calculator, and you will get an error message! To answer this question correctly, we need to determine which number gives us a zero in the denominator when it's plugged in for x. The fastest way to do this is to set the denominator equal to zero, and solve for x:

$\rightarrow 2 - x = 0 \rightarrow 2 = x$

2 is the answer. To confirm this, let's plug 2 back into the expression for x:

$\rightarrow y = \frac{7x}{2-2} \rightarrow y = \frac{7x}{0}$, this gives us a zero in the denominator, which results in a divide by zero error. The expression is thus undefined where x = 2.

29. Answer C

Explanation:

First of all, $-\frac{7}{3}$ is an improper fraction, so we'll need to convert it to a mixed number. To do this, we want to ask *what number multiplied by 3 will give us a number that is close to 7, but still less* *than 7?* Multiplying 3 by 2 gives us 6, which we can add one to to get 7. So here's the mixed number we get:

$\rightarrow -2\frac{1}{3}$

The goal is now to find approximately where $-2\frac{1}{3}$ would fit on the number line. Since we have a negative number, we can eliminate A and B because the arrows in these answer choices point to positive numbers. The number $-2\frac{1}{3}$ is less than -2, but greater than -3, and so it would be found between -2 and -3 on the number line. Therefore, C is the correct answer.

30. Answer: E

Explanation:

It is helpful to start by rewriting this problem so that the numbers all line up in columns. We've highlighted the tens column in blue, and the hundreds column in red:

$$\begin{array}{r} 56 \\ +\ 79 \\ \hline \end{array}$$

We next want to add the numbers in the ones place of both 56 and 79 (in other words, we want to add the 6 and the 9). When we do this, we get 15. We handle this by putting the 5 from the 15 down in the ones column of the answer, and putting the 1 from the 15 up above the hundreds column:

$$\begin{array}{r} 1 \\ 56 \\ +\ 79 \\ \hline 5 \end{array}$$

Adding up 1, 5, and 7 gives us 13. First, we put the 3 down in the tens place of the answer, and put the 1 up above the hundreds column. Since neither 56 or 79 has values in the hundreds column, we can just write in zeroes. Adding 1, 0, and 0, gives us… just 1!

$$\begin{array}{r} 11 \\ 056 \\ +\ 079 \\ \hline 135 \end{array}$$

The answer is thus 135.

31. Answer: E

Explanation:
We can start by simplifying each fraction. The first fraction can be simplified by dividing both 10 and 20 by 2:

$\rightarrow \frac{10}{20} \rightarrow \frac{1}{2}$

The second fraction can be simplified by dividing both 3 and 30 by 3:

$\rightarrow \frac{3}{30} \rightarrow \frac{1}{10}$

We can now rewrite the problem as $\frac{1}{2} \div \frac{1}{10}$.

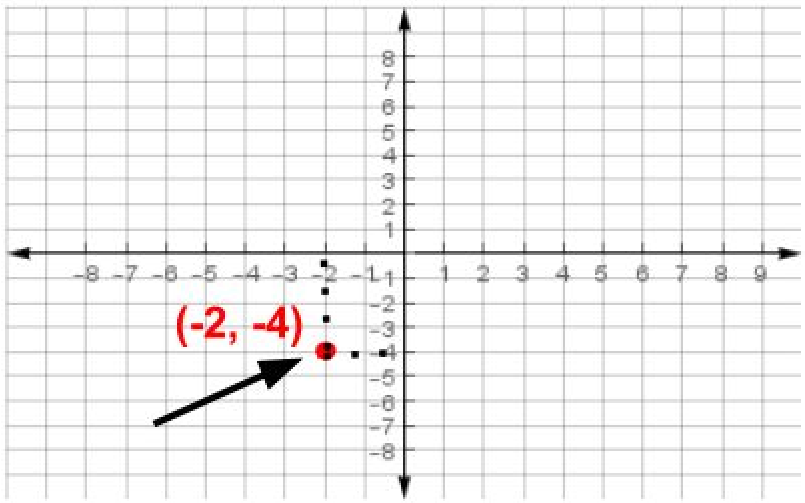
Lastly, we need to flip the second fraction so that the numerator and denominator are swapped, and then we multiply:

$\rightarrow \frac{1}{2} \div \frac{1}{10} \rightarrow \frac{1}{2} \times \frac{10}{1} \rightarrow \frac{10}{2} \rightarrow$ simplify $\rightarrow \frac{5}{1} \rightarrow 5$

The answer is thus E, none of the above!

32. Answer: C

Explanation:
This question is testing you on your ability to identify the coordinate pair of a point on a graph. This skill will be very important for many different kinds of problems! The vertical line is called the *y axis*, and the horizontal line is called the *x axis.* The trick is to look directly at the point, then first check which number it corresponds to on the x axis. This number will be written first in the coordinate pair. After you have the x coordinate, go back to the point and then check which number corresponds to it on the *y axis*. This point will be your y coordinate.



33. Answer: E

<u>Explanation:</u>

This question is testing your understanding of the order of operations rules. There is a specific order that you must always perform the operations (addition, subtraction, multiplication, etc…) in to get the correct answer. The order of operations rules can be summed up as "P. E. M. D. A. S."

<u>P. E. M. D. A. S.</u>

P = Parenthesis
E = Exponents
M = Multiplication
D = Division
A = Addition
S = Subtraction

P. E. M. D. A. S. ⇔ *<u>P</u>lease <u>E</u>xcuse <u>M</u>y <u>D</u>ear <u>A</u>unt <u>S</u>ally*

Have you ever heard the saying "please excuse my dear aunt sally" before in a math class? This saying is the classic way numerous students have remembered P. E. M. D. A. S over the years. In the phrase, the first letter of each word corresponds to a letter in P. E. M. D. A. S.

Recall the problem: $(16 - 5)^2 - 30 \, x \, 4 + 16 = ?$

We need to complete the calculation according to the order of operations rules. Let's go through each letter of P. E. M. D. A. S. starting with the P. The P stands for parenthesis, so we begin with the operations in the parenthesis:

$\rightarrow (16 - 5)^2 - 30 \, x \, 4 + 16 \rightarrow (11)^2 - 30 \, x \, 4 + 16$

The E stands for exponents, so we next take care of the exponent:

$\rightarrow (11)^2 - 30 \, x \, 4 + 16 \rightarrow 121 - 30 \, x \, 4 + 16$

The M stands for multiplication, and so we do the multiplication next:

$\rightarrow 121 - 30 \, x \, 4 + 16 \rightarrow 121 - 120 + 16$

The D stands for division, but because there is no division in this problem, we skip the D and go on to A. Recall that the A stands for addition:

$\rightarrow 121 - 120 + 16 \rightarrow 121 - 104$

(Note that we need to add negative 120 to 16. If you forget the negative sign, the answer will be completely different, and it will be incorrect)

Finally, we finish with the S, which stands for subtraction:

$\rightarrow 121 - 105 \rightarrow 17$

34. Answer: A

Explanation:

First, we need to pick two points on the line to use. Let's use (0, 4) and (-2, 0). Remember that the first number given in a coordinate pair (here 0 and -2) will always represent the x coordinate, and the second number (here 4 and 0) will always represent the y coordinate.

Let's label the given coordinates like this:

(0, 4), (-2, 0)

(x_1, y_1), (x_2, y_2)

Next, we can plug the numbers into the slope formula to get our answer.

Slope Formula:

$$\boxed{m = \frac{y_2 - y_1}{x_2 - x_1}}$$

Here's the calculation:

$$\rightarrow m = \frac{0-4}{-2-0} \rightarrow \frac{-4}{-2} \rightarrow 2$$

35. Answer: B

Explanation:

We recommend you begin problems like this by lining the numbers up into columns vertically like this:

$$\begin{array}{r} 222 \\ \times\ 11 \\ \hline \end{array}$$

Next, multiply the one in the ones column by each number in 222, starting with the 2 in the ones column:

$$\begin{array}{r} 222 \\ \times\ 11 \\ \hline 2 \end{array}$$

Next multiply one by the 2 in the tens column:

$$\begin{array}{r} 222 \\ \times\ 11 \\ \hline 22 \end{array}$$

Lastly, multiply 1 by the 2 in the hundred column:

$$\begin{array}{r} 222 \\ \underline{\times\ 11} \\ 222 \end{array}$$

Now, we focus on the 1 in the tens column, and multiply this 1 by each 2. However, we must first put down a zero as a placeholder:

$$\begin{array}{r} 222 \\ \underline{\times\ 11} \\ 222 \\ 20 \end{array}$$

Then we continue by multiplying the 1 in the tens column by the 2 in the tens column:

$$\begin{array}{r} 222 \\ \underline{\times\ 11} \\ 222 \\ 220 \end{array}$$

Lastly, we multiply the 1 in the tens column by the 2 in the hundreds column:

$$\begin{array}{r} 222 \\ \underline{\times\ 11} \\ 222 \\ 2220 \end{array}$$

To finish the problem, we need to add up the numbers we just got from multiplying:

$$\begin{array}{r} 222 \\ \underline{\times\ 11} \\ 222 \\ \underline{+\ 2220} \\ 2442 \end{array}$$

36. Answer: D

Explanation:
All of these answer choices are correct except for answer choice A. Please make sure you memorize each of the correct answers!

37. Answer: A

Explanation:
It sometimes helps students to think of solving for y as getting y by itself on one side.

Here's the calculation:

$$\rightarrow \frac{16}{5} = \frac{12}{y} \rightarrow 16 = \frac{5 \times 12}{y} \rightarrow 16 = \frac{60}{y} \rightarrow 16y = 60 \rightarrow \frac{16y}{16} = \frac{60}{16} \rightarrow y = \frac{60}{16} \rightarrow y = \frac{15}{4}$$

$\frac{15}{4}$ is an improper fraction, so we can convert it to a mixed number. The question we want to ask here is *4 times what number gives us a number close to, but less than, 15?* 4 x 3 = 12, so we want to use 3 as the whole number in the mixed number. Recall that the denominator in an improper fraction will be the same as the denominator in the mixed number, so we know that the denominator of the mixed number will be 4. To figure out the numerator, we can take 15 and subtract 12, which gives us 3. Putting this all together, we get:

$\rightarrow y = 3\frac{3}{4}$, which is equal to 3.75. Therefore, A is the correct answer.

***__Remember:__** $\frac{1}{4} = .25$, $\frac{2}{4} = .50$, $\frac{3}{4} = .75$, and $\frac{4}{4} = 1.00$

The best way to remember this is to think about money:

If you have 1 quarter, you have 25 cents $\rightarrow \frac{1}{4} = .25$

If you have 2 quarters, you have 50 cents $\rightarrow \frac{2}{4} = .50$

If you have 3 quarters, you have 75 cents $\rightarrow \frac{3}{4} = .75$

If you have 4 quarters, you have 1 dollar $\rightarrow \frac{4}{4} = 1.00$

38. Answer: B

Explanation:

The circle shows that the radius is 6. To find the diameter given the radius, multiply the radius by two. Make sure that you're clear on the difference between diameter and radius!

Radius = 6 vs Diameter = 12

Therefore answer choices A and C are correct, while answer choice B is incorrect, making B the right answer.

To confirm that D and E are correct, we want to use these formulas and plug in the value for the radius:

Area of a circle:

$$\boxed{\mathbf{Area_{circle}} = \pi\, \mathbf{r}^2}$$

Circumference of a circle:

$$\boxed{\mathbf{Circumference_{circle}} = 2\pi\, \mathbf{r} = \pi\, \mathbf{d}}$$

Here's the calculation for the area:

$\rightarrow \text{Area}_{\text{circle}} = \pi\,(6)^2 \;\rightarrow \text{Area}_{\text{circle}} = 36\pi$

Here's the calculation for the circumference:

$\rightarrow \text{Circumference}_{\text{circle}} = 2\pi\, 6 \;\rightarrow \text{Circumference}_{\text{circle}} = 12\pi$

39. Answer: B

Explanation:

First of all, you need to recognize that this is a quadratic equation.

Standard form of a quadratic equation:

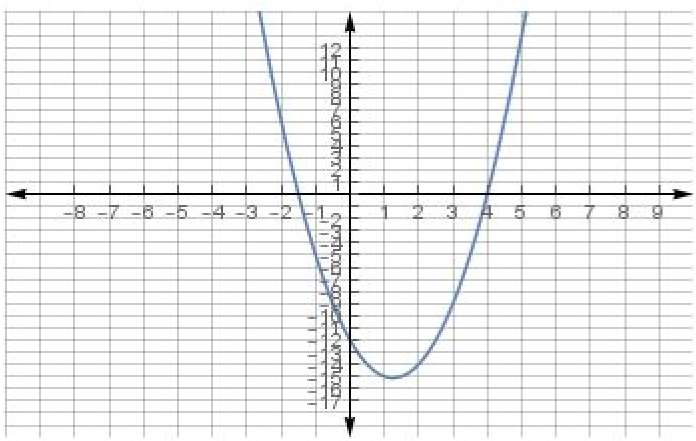
$$ax^2 + bx + c = 0$$

Solution to a quadratic equation:

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

For this problem, *a* equals 2, *b* equals -5, and *c* equals -12.

Here's what the graph of the equation $2x^2 - 5x - 12$ looks like.



There are two ways to solve this problem. The first is the simplest, because it will give you the correct answer 100% of the time as long as you do all of the math right.

Method 1: Plug the numbers into the solution

$$\rightarrow x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} \rightarrow x = \frac{-(-5) \pm \sqrt{(-5)^2 - (4)(2)(-12)}}{(2)(2)} \rightarrow$$

$$x = \frac{-(-5) \pm \sqrt{(25) + (96)}}{(4)} \rightarrow x = \frac{5 \pm \sqrt{121}}{4}$$

At this point, we need to break the problem up into plus and minus. Some students find this part confusing, so allow us to clarify what we mean. The square root of 121 is 11, so we can replace $\sqrt{121}$ with 11. We next add 5 to 11, then divide the result by 4. This will give us the “plus” answer.

Plus:

$$\frac{(5 + 11)}{4} \rightarrow \frac{16}{4} = 4$$

Lastly, we’ll need to do the exact same thing, except we do 5 - 11 instead of 5 plus 11:

Minus:

$$\frac{(5 - 11)}{4} \rightarrow -\frac{6}{4} \rightarrow -\frac{3}{2}$$

The solutions are thus x = 4 and x = $-\frac{3}{2}$.

Method 2: Factoring

Method 2 is not as straightforward as method 1, but once you’ve mastered it, you will usually be able to get the answer faster using it.

Step 1: Identify the first and last numbers in the quadratic equation, and multiply them together:

→ $2x^2 - 5x - 12$ (note that we MUST include the negative sign!)

→ $(2)\cdot(-12) = -24$

Step 2: List pairs of numbers that multiply together to equal negative 24

→ (2, -12), (-2, 12), (4, -6), (-4, 6), (8, -3), (-8, 3) etc…

Step 3: Select the pair in which the numbers add up to equal the *b* term, -5:

→ -8 + 3 = -5, so we want to use the pair (-8, 3)

(Please note that it’s not necessary to list all of the pairs, you can stop as soon as you find a pair in which the numbers add up to equal the *b* term!)

Step 4: Divide each number in the pair (-8, 3) by the *a* term, 2, and simplify if possible. Let’s start by dividing -8 by 2:

$\rightarrow -\frac{8}{2} = -4$, there is no simplification possible, so we stick with -4.

Next, we divide 3 by 2:

$\rightarrow \frac{3}{2}$, again, there is no simplification possible, so we stick with $\frac{3}{2}$.

Step 5: Write an x, and then plus or minus each respective term:

$\rightarrow (x - 4), (x + \frac{3}{2})$.

Note that because in the last step we got -4, we do x - 4, and because we got $\frac{3}{2}$, we do $x + \frac{3}{2}$.

Q: Why do we write the x?

We need to check the denominator of the coefficient of the very first term in the quadratic equation from step 1: $2x^2$. The coefficient is the number in front of x^2, which we can see is 2. Although we don't normally write it in, the denominator for any whole number is just 1, so we can think of the coefficient as $\frac{2}{1}$. The number in the denominator, 1, gets written in front of the x. Since 1 times x is just x, we don't need to write the one. Please be aware that if we had a different number in the denominator, for example suppose the first term was $\frac{2}{3}x^2$, we would instead write $(3x - 4)$ and $(3x + \frac{3}{2})$, because of the 3 in the denominator.

A: Because there is a 1 in the denominator of the coefficient in the first term.

Step 6: Solve both $(x - 4)$ and $(x + \frac{3}{2})$ for x by setting the expressions equal to zero. Let's start with $(x - 4)$:

$\rightarrow x - 4 = 0 \rightarrow x = 4$

Lastly, we finish with $(x + \frac{3}{2})$:

$\rightarrow x + \frac{3}{2} = 0 \rightarrow x = -\frac{3}{2}$.

This method confirms that the solutions are $x = 4$ and $x = -\frac{3}{2}$.

40. Answer: E

Explanation:

These are all true! Knowing some of the most common square roots off the top of your head will be very helpful for you on the test! Here is a table containing some square roots that are great to commit to memory:

Common Square Roots:

$\sqrt{1} = 1$
$\sqrt{4} = 2$
$\sqrt{9} = 3$
$\sqrt{16} = 4$
$\sqrt{36} = 6$
$\sqrt{49} = 7$
$\sqrt{64} = 8$
$\sqrt{81} = 9$
$\sqrt{100} = 10$
$\sqrt{121} = 11$
$\sqrt{144} = 12$

41. Answer: B

Explanation:

Whenever you see a problem that involves a percentage, there's a great chance that you'll be able to apply the formula we introduced earlier.

Formula for Solving Percent Problems:

$$\frac{is}{of} = \frac{\%}{100}$$

Consider the question again: *What was the original price of the pair of shoes?* The word "of" in the question here is a hint that we want to plug in a variable for *of* in the equation, and then solve for this variable. Let's set the problem up by plugging all of the given values into the formula, and plugging in x for the *of* term:

$$\longrightarrow \frac{65.99}{x} = \frac{60}{100} \longrightarrow \frac{65.99}{60} = \frac{x}{100} \longrightarrow \frac{(100)\cdot(65.99)}{60} = x \longrightarrow 109.98 = x\,.$$

The last step here is to round 109.98 to the nearest whole number. To do this, we need to look at the term in the tenths place, marked in red: 109.98. This term is a 9, so we know that 109.98 will round to 110, so the answer is $110.00.

42. Answer C

Explanation: Let's begin by reviewing some probability basics.

Probability Notes:

Definition of Probability: How likely an outcome is to occur.

Formula for the probability of an outcome occurring:

$$Probability\ of\ an\ outcome = \frac{The\ number\ of\ ways\ an\ outcome\ can\ occur}{The\ total\ number\ of\ outcomes\ that\ can\ occur}$$

Here, the outcome we want is to draw a blue marble. To solve this problem, we need to first count up the total number of marbles:

$\rightarrow$ 9 blue + 7 red + 1 yellow + 10 green = 27 total marbles

This number will go in the denominator (the number on the bottom) in the formula. Since the outcome we want is to draw a blue marble, the number of blue marbles will go in the numerator of the formula (the number on the top).

Here's the calculation:

$$\rightarrow Probability\ of\ drawing\ a\ blue\ marble = \frac{\#\ of\ blue\ marbles}{\#\ of\ marbles\ total} = \frac{9}{27} = \frac{1}{3}$$

43. Answer: D

Explanation:

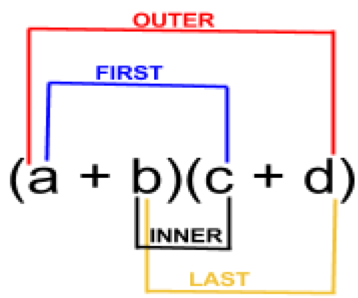
First, let's briefly review some important definitions:

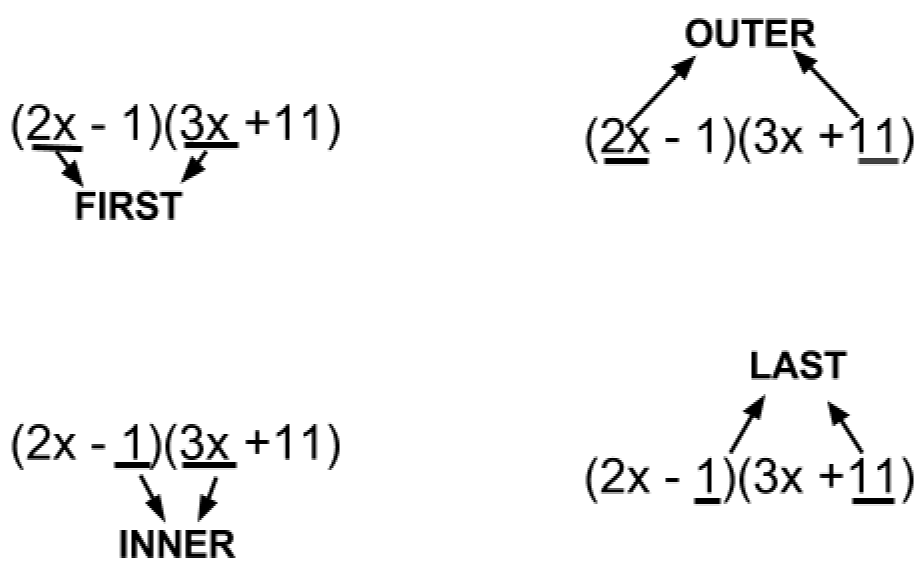
Polynomials consists of 3 parts: constants, variables, and non-negative exponents. The parts can be combined by addition, subtraction, multiplication, or division, as long as there is no division by a variable! A **monomial** is a polynomial with only one term, and a **binomial** is a polynomial with 2 terms that are each monomials. Lastly, a **trinomial** is a polynomial with 3 terms that are each monomials. We will look at examples of each at the end of this explanation.

To solve this problem, we need to use the F.O.I.L. method:

The F.O.I.L. Method:

F. = First
O. = Outer
I. = Inner
L. = Last





First: $(2x)\cdot(3x) = 6x^2$

Outer: $(2x)\cdot(11) = 22x$

Inner: $(-1)\cdot(3x) = -3x$ (it's crucial to remember to use negative 1 here in this multiplication)

Last: $(-1)\cdot(11) = -11$ (again, it's crucial to remember to use negative 1 in the multiplication)

Now we need to put everything together by combining the like terms. Please note that we can subtract 3x from 22x to get 19x. Alternatively, you can think of this as adding -3x to 22x to get 19x:

$\rightarrow 6x^2 + 22x - 3x - 11 \rightarrow 6x^2 + 19x - 11$

The answer is $6x^2 + 19x - 11$!

Note: You will absolutely need to master the F.O.I.L. method to ace the exam! It is almost guaranteed to show up on the test at least once, but there's a very good chance it will be on the test multiple times!

*****Remember:** Polynomials consists of 3 parts: constants, variables, and non-negative exponents. The parts can be combined by addition, subtraction, multiplication, or division, as long as there is no division by a variable!

	Monomial	**Binomial**	**Trinomial**
Definition	A polynomial with only one term	A polynomial with 2 terms that are each monomials	A polynomial with 3 terms that are each monomials.
Examples	$3x$; x; 1; $7x$; $14x^2$	$3x + 1$; $x + 7$; $4x^2 - 2y$	$3x^2 + 22x + 7$; $14x^2 - 23x + 18$

44. Answer D

Explanation:

This problem gives us a great opportunity to review exponent rules!

<u>Essential Exponent Rules To Know:</u>

Product Rules:	**Quotient Rules:**	**Power Rules:**
$a^n \cdot a^m = a^{n+m}$ $a^n \cdot b^n = (a \cdot b)^n$	$\frac{a^n}{a^m} = a^{n-m}$ $\frac{a^n}{b^n} = (\frac{a}{b})^n$	$(b^n)^m = b^{n \cdot m}$ $b^{n^m} = b(n^m)$ $\sqrt[m]{b^n} = b^{\frac{n}{m}}$ $b^{\frac{1}{n}} = \sqrt[n]{b}$
Zero Rules:	**One Rules:**	**Negative Exponent Rules:**
$b^0 = 1$ $0^b = 0$ when $b > 0$	$b^1 = b$ $1^b = 1$	$b^{-n} = \frac{1}{b^n}$ $b^n = \frac{1}{b^{-n}}$

Answer choice D is false, and should instead read: $\sqrt[5]{a} = a^{\frac{1}{5}}$

Please review the rules in the table, and make sure you understand why answer choices A, B, C, and E are correct!

45. Answer: C

<u>Explanation:</u>
This explanation is very important to understand, because in it we're going to cover *conversion factors*. Conversion factors are extremely useful for quickly solving many of the word problems you'll come across on the real exam!

Both inches and feet are units for measuring length. Conversion factors give us a quick way to convert from one unit to another. In this question, there are three essential bits of information given: *the unit we need to find, the unit we should start with*, and *the conversion factor.* The question is asking us to determine how many inches are in 68 feet, so the unit we need to find is inches. We are explicitly given 68 feet as a value, so we want to first write this down (it will be more clear soon why we want to start with this). Note that we're abbreviating inches as *in,* and feet as *ft.*

→ 68 *ft*

The last bit of information we're given is the actual conversion factor, which here is the number of inches in 1 foot. We can write the conversion factor in one of two ways:

→ $\frac{12\ in}{1\ ft}$ OR $\frac{1\ ft}{12\ in}$

<u>Q: How do we know which way to use?</u>

<u>A:</u> We need to look at the units on the number that we just wrote down! Since we started with 68 ft, we want to use the conversion factor arrangement that has units of feet in the denominator so that this unit will cancel out, leaving us with an answer in inches:

$$68\ \cancel{ft}\ x \frac{12\ in}{1\ \cancel{ft}} = 68\ x\ 12\ in$$

<u>Q: Why do the units cancel?</u>

Whenever we have a fraction with the same number on the top and bottom, we can cancel them both out. This is true because any number divided by itself equals 1. When we say that we've "canceled out," what we've really done is divided something by itself to get 1. For example, 14 divided by 14 equals 1, and it's the exact same thing with the units. Feet divided by feet equals 1, so we say the units "canceled out."

To finish the problem:

→ 68 x 12 *in* = 816 *in*.

46. Answer: C

<u>Explanation:</u>

We know that there are 23 students, and that the class is made up of both boys and girls. Therefore, the total number of students equals the total number of girls plus the total number of boys:

→ Total # of students = Total # of girls + Total # boys

We know the total number of students, and the total number of boys, but not the total number of girls. We can represent the unknown number of girls with a variable, x. This gives us the equation in answer choice c:

→ $23 = x + 12$

Although this question only requires you to be able to setup the equation, be aware that solving the equation for x (getting x alone on one side) gives us the number of girls.

47. Answer: A

Explanation:

Let's start by labeling the tenths, hundredths, and thousandths place for each of the given numbers.

Number	Tenths place	Hundredths place	Thousandths place
33.333	33.333	33.333	33.333
17.777	17.777	17.777	17.777
14.221	14.221	14.221	14.221
2.340	2.340	2.340	2.340

To round a number to the nearest tenths place, we must look at the number in the hundredths place directly to the right of it. For 33.333, the tenths place is marked in red, and the hundredths place is marked in blue: 33.333. If the blue number is less than 5, then we leave the red number just as it is. If the blue number is 5 or greater, then we increase the red number by one. The blue number, 3, is less than 5, so we know that 33.333 rounded to the nearest tenth equals 33.33.

Let's apply the same reasoning to 17.777. Again, let's mark the tenths place in red, and the hundredths place in blue: 17.777. The question we want to ask now is *is the blue number 5 or greater?* 7 is greater than 5, so we can conclude that 17.777 rounded to the nearest tenth equals 17.78.

Next let's evaluate 14.221. Again, let's mark the tenths place in red, and the hundredths place in blue: 14.221. We can see that the number in blue is less than 5, so we leave the tenths place the same. Therefore, 14.221 rounded to the nearest tenth equals 14.22.

Lastly, we need to check 2.340. One last time, let's mark the tenths place in red, and the hundredths place in blue: 2.340. Because the blue number is less than 5, the red number will stay the same, so we know that 2.340 rounded to the nearest tenth equals 2.3.

48. Answer: B

Explanation:

This is a *system of equations* problem. The word *system* in the question should give this away, but they might not give you this word on the test, so it is best to remember how to recognize it. Whenever you are given a question with both 2 equations *and* 2 variables (in this problem we're given both *x* and *y*), you should recognize that it's probably a *system of equations* problem! There are 2 methods for solving these problems:

Method 1: Substitution:

The upside of the substitution method is that most students find it easier to understand, but the downside is that it can take longer to apply. For this method, we want to start out by solving one of the equations for one variable. Let's use equation 1 and solve it for *x* (this means get *x* by itself on one side of the equation). To do this, we need to add 12 on both sides of the equation:

Equation 1 → $x - 12 = 4y$ → $x = 4y + 12$

$\quad\quad + 12 \quad + 12$

Now that we've solved equation 1 for *x,* we will plug *4y + 12* from equation 1 into equation 2 for x:

Equation 1 → $X = 4y + 12$

Equation 2 → $6x = 60y$

Here's what we get:

$\rightarrow 6x = 60y$, substitute $4y + 12$ in for x $\rightarrow 6(4y + 12) = 60y$

Next, we distribute the 6 (this means we multiply 6 by 4y, then we multiply 6 by 12). 6 times 4y equals 24y, and 6 times 12 equals 72:

$\rightarrow 6(4y + 12) = 60y$, distribute the 6 $\rightarrow 24y + 72 = 60y$

After distributing, we want to solve the equation for y (this means get y by itself on one side):

$\rightarrow 24y + 72 = 60y \rightarrow 72 = 60y - 24y \rightarrow 72 = 36y \rightarrow \frac{72}{36} = \frac{36}{36}y \rightarrow 2 = y$

$-\ 24y \qquad -\ 24y$

Now that we've found the value of y, we're almost done! We just need to plug 2 into either equation 1 or equation 2 for y, and then solve the equation for x. Let's use equation 2:

Equation 2 $\rightarrow 6x = 60y \rightarrow 6x = (60)\cdot(2) \rightarrow 6x = 120 \rightarrow \frac{6}{6}x = \frac{120}{6} \rightarrow x = 20$

We now know that $y = 2$, and $x = 20$, so we're done!

Method 2: Cancellation by addition:

While this method is typically faster than method 1 once you've mastered it, it's not as always as straightforward, so stick with what works best for you!

First, let's solve equation 1 for x, just as we did in the first method:

$x = 4y + 12$

$6x = 60y$

Please note how the x terms in both equations line up with each other, and that the same is true for the y terms. This is critical because we want to add the two equations together so that we can cancel out one of the variables. Note that if we multiply each term in equation 1 by negative 6, this is what we get:

$-6x = -24y - 72$

$6x = 60y$

Consider the results when we add these two equations:

$\rightarrow 0 = 36y - 72$

Do you see that the x terms have canceled out? This was our goal! Let's next solve the equation for y:

$\rightarrow 0 = 36y - 72 \;\rightarrow 72 = 36y \rightarrow \frac{72}{36} = \frac{36}{36}y \;\rightarrow 2 = y$

$+ 72 \qquad + 72$

Now that we know the value of y, we can finish by plugging 2 into either equation for y, just like we did in method 1 to get the answer!

49. Answer: B

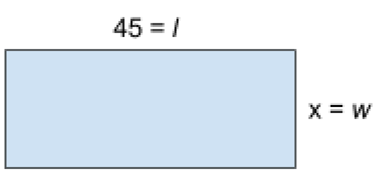
Explanation:
The area and perimeter of a rectangle can be calculated using these two formulas:

Area of a Rectangle:

$$A_{rectangle} = \text{length} \cdot \text{width}$$

Perimeter of a Rectangle:

$$P_{rectangle} = 2 \cdot \text{length} + 2 \cdot \text{width}$$



The length of the rectangle is 45, and we can label the unknown width as x. First, we want to use the formula for the area of a rectangle to determine the width.

$\rightarrow 45x = 270 \rightarrow x = 6.$

Now that we know both the length and width, we can simply apply the formula for the perimeter of a rectangle. Plugging the values into the formula gives us the answer:

$\rightarrow (2)\cdot(45) + (2)\cdot(6) \rightarrow 90 + 12 = 102$

50. Answer: D

Explanation:
This problem requires you to combine like terms wherever possible. What do we mean by *like terms?* In the table below, you'll see that we've organized all of the terms into 4 categories based

on whether they contain x^3, x^2, x, or just a number. We have given each category a specific color to illustrate which terms can be combined, and which terms cannot. Only terms of the same color can be combined!

x^3	x^2	x	#
$3x^3$	$123x^2$	66x	8
$- x^3$	$-86x^2$	44x	90
N/A	N/A	x	N/A

The key point to understand here is that we can only combine terms in the same category; we can only combine the like terms! Let's reorganize the problem so that we put the like terms together:

$\rightarrow 3x^3 - x^3 + 123x^2 - 86x^2 + 66x + 44x + x + 8 + 90$

Now we combine the like terms to get the answer:

$\rightarrow 2x^3 + 37x^2 + 111x + 98$

Here's the answer shown with no colors:

$\rightarrow 2x^3 + 37x^2 + 111x + 98$

Closing:

This concludes your 50 problem free sample! You are undoubtedly getting closer to acing the math portion of the real exam by completing it! We hope that you enjoyed this free sample, and that you've found it helpful towards your studying. For best results, we recommend going back through all of the problems at least 2-3 more times, as the extra repetition will really help everything stick for you! The full version is available for purchase now on

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