**Quantitative Reasoning Test 2: 30 Questions with answers & explanation.**

**Directions: All numbers are real numbers. Do not use a calculator, but scratch paper is allowed. There are four or five answer choices for each question. Answer each question before moving on (don't leave anything blank). For each question, indicate the best answer, using the directions given**

**Question 1-12 have several different format- multiple choice questions and numeric entry questions. Unless directed select a single answer choice**

1.      S = {y-z, x}. The mean of set S is 3y. What is the unknown member of the set, x, in terms of y and z?

A      3y
B      z – 5y
C      z + 5y
D      z - 3
E      4y + 3

2.

(0.00020/0.00001)·(0.030/0.002)

A      0.3
B      0.4
C      30
D      300
E      400

3. The sum of the digits of a certain two-digit number is 7.  Reversing its digits creates a second number which is larger than the first by 9.  The first number is

I      43

II      25
III     34

A       I only
B       I and II only
C       II and III only
D       III only
E       I and III only

4.  Joe sells newspapers. On Monday he sold 15 newspapers, on Tuesday 20, and on Wednesday 25. To the nearest one percent, what was the percentage increase in his sales from Monday to Wednesday?

A       10%
B       17%
C       25%
D       67%
E       167%


5. A certain triangle has angles such that the ratio of the angles A:B:C = 1:3:5. Four times the measure of angle B is

A       12°
B       36°
C       80°
D       240°
E       400°

6. The length of a side of a certain square T is twice the length of a side of another square S. If the sum of their perimeters is 444 units, what is the length of a side of square T?

A       37
B       55.5
C       74
D       148
E       296

7. Two trains leave from the same station, travelling in opposite directions.  One train travels at a speed 15 km/hr slower than the other. After 16 hours they are 1680 km apart. Find the average speed of the slower train.

A      15 km/hr
B      30 km/hr
C      45 km/hr
D      60 km/hr
E      The answer cannot be determined from the information given

8. Ian regularly empties his pockets of coins into a jar. One day, he counts the money and finds that he has $22.50 in nickels (worth 5 cents each), dimes (each worth 10 cents), and quarters (each worth 25 cents.) He has 3 times as many nickels as dimes, and 6 more quarters than dimes. How much money does he have in quarters?

A      $11.25
B      $12.00
C      $15.50
D      $19.75
E      $20.50

9. $-7x - 2y = -13$, and $x - 2y = 11$.  The variable $y =$

A      -3
B      -4
C      3
D      4
E      7

10. At a school event four kinds of ice cream were served: vanilla, chocolate, swirl, and strawberry. 26% of the students requested vanilla, and 30% requested chocolate. 500 servings of ice cream were given out. How many students requested strawberry?

A    44
B    110
C    220
D    280
E    The answer cannot be determined from the information given.


11. An electronics store had a 10% off sale. Items that did not sell were marked down another 10%, and then what was left was marked down another 15% for clearance. A certain item's original price before the sales was $150. What was its clearance price?

A    $52.50
B     $97.50
C    $103.278
D    $103.27
E    $103.28

12.    A group of six students run in an election for the two positions of class president and vice president.  How many different possible president-vice president combinations can be elected?

A    12
B    15
C    30
D    45
E    720

**Direction: For each of question, 13-30, compare column A and Column B and select one of the following 4 answer choices of the question.**
- **The quantity in Column A is greater.**
- **The quantity in Column B is greater.**
- **The two quantities are equal.**
- **The relationship cannot be determined from the information given.**


13. $x^2 + 4x = 32$

Column A: 4

Column B: 8+sum of all possible values of x

A       The quantity in Column A is greater.
B       The quantity in Column B is greater.
C       The two quantities are equal.
D       The relationship cannot be determined from the information given.

14.

Column A: Liters of 10% acid to be added to 16 liters of 25% acid to achieve a 20% solution

Column B: Liters of 20% acid to be added to 10 liters of 30% acid to obtain a 25% solution

A       The quantity in Column A is greater.
B       The quantity in Column B is greater.
C       The two quantities are equal.
D       The relationship cannot be determined from the information given.

15.

Column A  $3^{15} + 3^{13} + 3^{14}$

Column B  $3^{16}$

A       The quantity in Column A is greater.
B       The quantity in Column B is greater.
C       The two quantities are equal.
D       The relationship cannot be determined from the information given.

16.

Column A:  $\sqrt{4^2 + 7^2}$

Column B:  $\sqrt{5^2 + 6^2}$

A       The quantity in Column A is greater.
B       The quantity in Column B is greater.
C       The two quantities are equal.
D       The relationship cannot be determined from the information given.

17.  5x – y = 3, and –x – y = -39

Column A: $x^2$

Column B: y + 16

A       The quantity in Column A is greater.
B       The quantity in Column B is greater.
C       The two quantities are equal.
D       The relationship cannot be determined from the information given.

18. A six-sided die is rolled several times and the results recorded.

Column A: The probability of rolling a prime number on each of two rolls

Column B: The probability of rolling an even number or a 1 on each of three rolls

A       The quantity in Column A is greater.
B       The quantity in Column B is greater.
C       The two quantities are equal.
D       The relationship cannot be determined from the information given.

19. $(-1)^{-x} = -1$ and $x$ is a positive integer $\neq 0$

Column A: 3

Column B: x

A       The quantity in Column A is greater.
B       The quantity in Column B is greater.
C       The two quantities are equal.
D       The relationship cannot be determined from the information given.

20.    y = -2x + 4

Column A: the area bounded by the coordinate axes and the line

Column B: 8

A       The quantity in Column A is greater.
B       The quantity in Column B is greater.
C       The two quantities are equal.
D       The relationship cannot be determined from the information given.

21. Colored marbles are drawn at random from a bag without replacing any. In the bag are four clear marbles and seven black marbles.

Column A: The probability of drawing two clear marbles

Column B: The probability of drawing three black marbles

A       The quantity in Column A is greater.
B       The quantity in Column B is greater.
C       The two quantities are equal.
D       The relationship cannot be determined from the information given.

22. Parts at a factory are packed into shipping containers. The weights of the boxes are approximately normally distributed with an average of 50 pounds and a standard deviation of 7 pounds.

Column A:

The approximate percentage of boxes that weigh less than 43 pounds

Column B:

The approximate percentage of boxes that weigh more than 64 pounds

A       The quantity in Column A is greater.
B       The quantity in Column B is greater.
C       The two quantities are equal.
D       The relationship cannot be determined from the information given.

23. Elephants in a zoo require approximately 150 pounds of food per day. Elephants in the wild require approximately 315 pounds of food per day.

Column A:

The amount of food required by three zoo elephants for one week

Column B:

The amount of food required by five wild elephants for two days

A       The quantity in Column A is greater.
B       The quantity in Column B is greater.
C       The two quantities are equal.
D       The relationship cannot be determined from the information given.

24.

Column A:

$$\frac{7!3!}{5!2!}$$

Column B:

5!

A       The quantity in Column A is greater.
B       The quantity in Column B is greater.
C       The two quantities are equal.
D       The relationship cannot be determined from the information given.

25.     Column A                                      Column B

$(\sqrt{7} + 13)(\sqrt{7} - 13)$                                $-(13 + \sqrt{7})(13 - \sqrt{7})$

A       The quantity in Column A is greater.
B       The quantity in Column B is greater.
C       The two quantities are equal.
D       The relationship cannot be determined from the information given.

26.

Column A: The area of a circle with diameter 26

Column B: The area between two concentric circles with radii 15 and 6

A       The quantity in Column A is greater.
B       The quantity in Column B is greater.
C       The two quantities are equal.
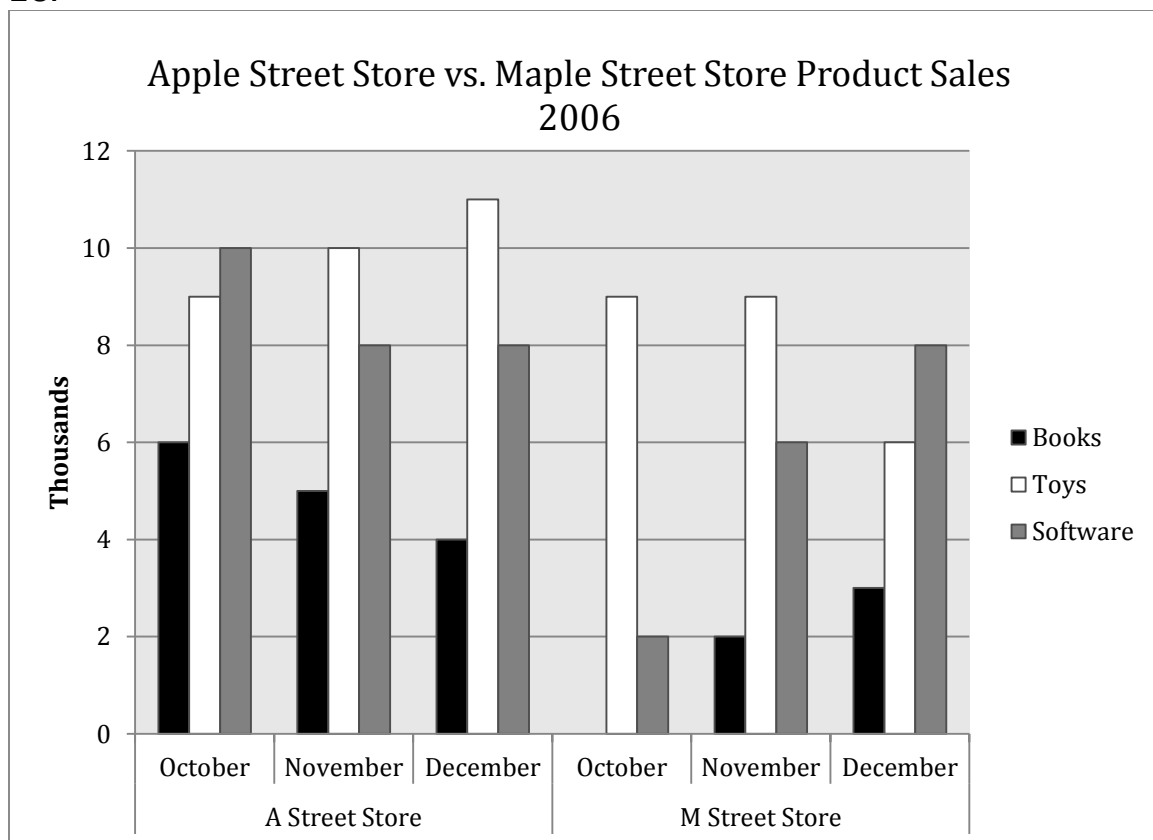D       The relationship cannot be determined from the information given.

27.    Candy pieces of the same size but differing colors are mixed to make 5-pound bags for bulk sale. The colors red, yellow, blue, and green are included in the ratio 4 : 5 : 3 : 3.

Column A: The approximate number of pounds of red and blue candy in three bags

Column B: The approximate number of pounds of yellow candy in five bags

A    The quantity in Column A is greater.
B    The quantity in Column B is greater.
C    The two quantities are equal.
D    The relationship cannot be determined from the information given.

28.



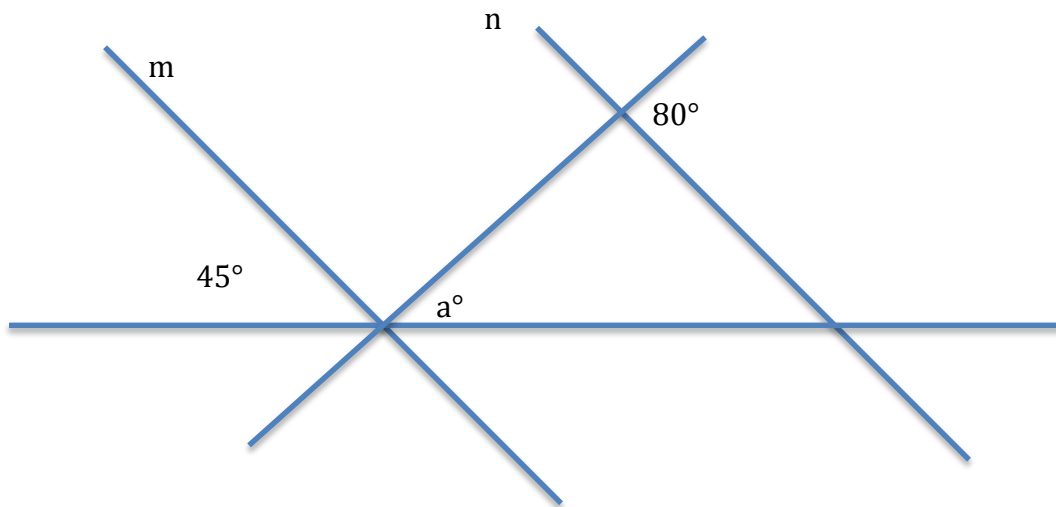Apple Street Store vs. Maple Street Store Product Sales 2006

Column A: November sales

Column B: December sales

A       The quantity in Column A is greater.
B       The quantity in Column B is greater.
C       The two quantities are equal.
D       The relationship cannot be determined from the information given.

29. Given line m is parallel to line n. The measure of angle a° is



A       35
B       45
C       65
D       Not possible to calculate from the information given

30.
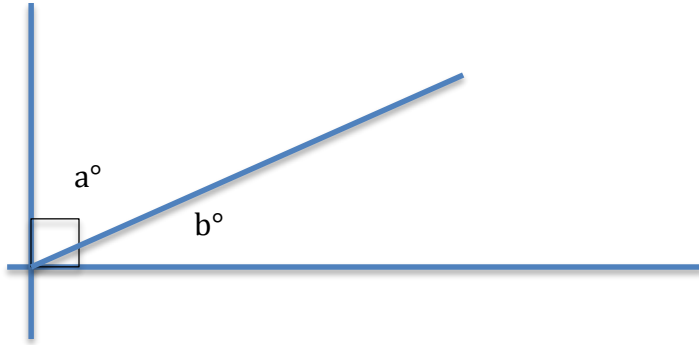


The ratio of the measures of the two complementary angles shown is 2:3.  Angle a is

A    30
B    36
C    54
D    60
E    72

## Answers & Explanation

1. Answer: C.

Explanation:  The mean is the average of the set, so the given mean 3y equals the sum of the given first term and an unknown second term x divided by two: 3y = [(y-z)+x]/2. Solving, x = 6y – y + z = 5y + z = z + 5y.

2. Answer: D

Explanation: Clear the decimals by multiplying the numerators and denominators by the same powers of 10 and things become more clear: For the term in the first parentheses, moving the decimal to the right five times results in 20/1 = 20, while for the second parentheses moving the decimal to the right 3 times results in 30/2 = 15. The final answer is 20(15) = 300.

3. Answer: D

Explanation: If you are handy with algebra you can let a = the first digit and b = the second; the value of the first number will then be 10a+b. We know that a+b = b+a = 7. The value of the second number can be written 10b+a, which will equal 10a+b + 9. That's two equations in two unknowns. The second reduces to b-a=1; add this to b+a=7. The a's cancel and you find that b=4, and then a=3, so the first number is 43 and the second is 34. The way to fake it is to first check each answer choice

to be sure the digits sum to 7; they do. Next, reverse the digits and see if the second number is 9 more than the first. This is only true of 34. Be careful not to pick choice E; 34 and 43 have an absolute <u>difference</u> of 9, but only 43 (the reverse of 34) is <u>larger</u> by 9.  This second method of approaching the problem may be a bit faster than the first.

4. Answer: D.

Explanation:  The formula to use for percent of change is the 100(new value-old value)/(old value). In this case, the old value is Monday's 15 papers. The new value is Wednesday's 25. The formula is 100(25-15)/(15) = 66 2/3% = 67%.

5. Answer: D.

Explanation: The angles of any triangle sum to 180. For this triangle, the 180 degrees are apportioned in the ratio 1:3:5, which means there are 9 "parts" total. Dividing 180 by 9 means that there are 20 degrees in each part. Angle A gets one "part", or 20 degrees, B 3 "parts" or 60 degrees, and C 5 "parts", or 100 degrees. Four times the measure of angle B is 4 * 60 = 240.

6. Answer: C.

Explanation: Let s = the length of a side of the smaller square, and 4s its perimeter. Let 2s = the larger square side, and so its perimeter is 8s. Adding the perimeters, 4s + 8s = 444, so s = 37. DON'T choose answer choice A, because it doesn't answer the question. You want the length of a side of square T, or 2s = 37*2 = 74.

7. Answer: C

Explanation:  An old algebra class standby, the distance-rate-time problem. Let f = rate of the faster train; then the rate of the slower train will be f-15. The faster train travels a distance of $d_f$ = f (16), while the slower train travels $d_{slow}$ = (f-15)(16) = 16f –240. Together these must combine for the 1680 km, so 16f + 16f – 240 = 1680, so 32f = 1920. Divisibility rules come in handy to simplify this calculation. Solving, f = 60 km/hr; the speed of the slower train = f-15 = 45 km/hr.

8. Answer: B

Explanation: let n = # of nickels, d = # of dimes, and q = # of quarters. Then, n = 3d and q = d+6. Each nickel is worth 0.05 dollars, each dime 0.10, and each quarter 0.25, and it all has to add up to $22.50. So (0.05)n + (0.10)d + (0.25)q = 22.50. Multiply through by 100 to clear the decimals, to get 5n + 10d + 25q = 2250. Now, put everything in terms of d: 5(3d) + 10d + 25(d+6) = 2250. Multiply through: 15d + 10d + 25d +150 = 2250. Combine like terms and solve for d: 50d =2100, so d = 42. Then n = 3d = 126 and q = 48. The value of 48 quarters is 48(0.25) = $12.00.

9. Answer: B.

Explanation: This is a system of equations in two variables. Subtract the second equation from the first to get x = 3. Be sure to track the negatives! Then 4x = 12. Use the second equation to find y=(11-x)/-2 = (11-3)/-2 =-4. Again, it is easy to lose track of the negatives.

10. Answer: E.

Explanation:  It is possible to find the number of servings of vanilla and chocolate: 0.26(500) = 130, and 0.30(500) = 150, respectively. However, there is not enough information given in the problem to determine how the swirl and strawberry divided up the other 220 servings.

11. Answer: E.

Explanation: Do not add up the percentages directly; each sale represented a markdown from the previous price. For three successive sales of 10%, 10%, and 15%, the final price of the item is (original price)(90%)(90%)(85%), or 150(0.9)(0.9)(0.85) = $103.278 or $103.28 (remember to round properly).

12. Answer: C.

Explanation: Six students have a chance at the president slot, and then the vice president will be chosen from the remaining five. So there are

(6)(5)=30 possibilities. You do not have to divide by 2, because the president-vice president combination is ordered; President Smith and Vice President Jones is not the same combination as President Jones and Vice President Smith.

13. Answer: C.

Explanation: Just looking at it, it looks like whatever B is, it's going to be larger than A.  However, this is a quadratic equation equivalent to $x^2 + 4x - 32 = 0$. Factor into (x + 8)(x – 4) = 0. In order for this equation to equal 0, either x+ 8 = 0 or x – 4 = 0. So, x must equal to either -8 or 4, the sum of which is -4. -4 added to 8 gives 4.

14. Answer: B.

Explanation: A mixture problem. Let A = the liters to be added in the first problem. The equation for Column A is: A(0.10) + 16(0.25) = (A+16)(0.20). Multiply through by 100 to simplify the decimal, and solve, for A = 8. For the second problem, let B be the number of liters to be added. B(0.20) + 10(0.30) = (B+10)(0.25). Solving, B = 10.

15. Answer: B.

Explanation: Here's the trick: Look at Column B first. Recognize that $3^{16}$ = 3 x $3^{15}$ = $3^{15}$ + $3^{15}$ + $3^{15}$.  Subtract  $3^{15}$ from both Column A and Column B. Now Column A is: $3^{13}$ +$3^{14}$ and Column B is:  $3^{15}$ + $3^{15}$. The two terms in Column B are both bigger than either term in Column A, so whatever those gnarly numbers are, the ones in Column B add up to more.

16. Answer: A.

Explanation: This question tests whether you know the rules for adding exponents.  Even if you don't, though, you can just calculate your way through. Although 4 + 7 = 5 + 6, $4^2 + 7^2 \neq 5^2 + 6^2$. Column A can be simplified to $\sqrt{16 + 49} = \sqrt{65}$, while Column B becomes $\sqrt{25 + 36} = \sqrt{61}$.

17. Answer: A.

Explanation: These are two simultaneous equations.  Use standard algebraic procedures to solve for x and y. For example, you could solve the second equation for y and plug it into the first equation to get x. Or, you could subtract the second equation from the first to cancel the y's and solve for x. Either way, once you have x = 7, plug it into the second equation to get y = 32. Now you can calculate Column A: $x^2$ = 49 and compare it to Column B: y + 16 = 48.

18. Answer: B.

Explanation: Each roll is independent of the others. The answer hinges on knowing that 1 is NOT a prime number. The three possible prime numbers, then, are 2,3, and 5, or ½ of the six total possibilities for one roll. For Column A: (1/2)(1/2) = ¼ = 25%. For Column B: The even numbers are 2, 4, and 6, and with 1 represent 4/6, or 2/3, of the six total possibilities. (2/3)(2/3)(2/3) = 8/27. Estimate this to be close to 30%. Or, you could compare ¼ to 8/27 by looking at what their numerators would be if they were to have the same denominators. To do this, multiply each fraction's numerator by the other's denominator. Since (1)(27) < (8)(4), the 8/27 "wins".

19. Answer: D.

Explanation: You may be tempted to pick answer choice C, since when x = 3 the equation holds true. But it would hold true for any odd number.

20. Answer: B.

Explanation: Sketch a quick graph of the line; make it easy by placing points where x = 0 and y = 0. This makes a triangle with base 2 units and height 4 units, so the area = 1/2bh = 4.

21. Answer: B

The total number of marbles is 4 + 7 = 11. In order to draw 2 clear marbles, you would have to get one the first try (4/11 chance) and one of the remaining three clear marbles out of the ten marbles left in the bag on the second try (3/10). Multiply these together – simplifying the 4

in the numerator and 10 in the denominator to 2/5 makes it easier –
and get 6/55. Estimate that this is about a 10% chance (you can figure it
out exactly later if you need to.) For the black marbles, on the first draw
you have (7/11) chance, (6/10) the next, and (5/9) on the third, as you
are successful in drawing black marbles and the number of marbles left
in the bag decreases. Multiplying these three fractions together –
simplifying the 6 and 5 in the numerator against the 9 and 10,
respectively, in the denominator to speed things along – to get 7/33.
Estimate that this is close to a 20% chance, enough bigger than the 10%
chance found earlier so that you don't need to actually calculate them
out.

22. Answer: A.

Explanation: The values of 43 and 64 fall at one and two standard
deviations, respectively, away from the mean. In a normal distribution,
approximately 34% of the data falls within one standard deviation
above, and another 34% below, the mean. Approximately 14% of the
data falls between the first and the second standard deviation on each
side of the mean, and approximately 2% of the data is found between
the second and third standard deviation marks on each side of the
mean. Altogether, across six standard deviations, 2% + 14% + 34% +
34% + 14%+ 2% = 100% of the data. The percentages below 43 (one
standard deviation below the mean of 50) are 14% and 2%, or 16%. The
percentage above 64 (two standard deviations above the mean) is only
2%. The theoretical normal distribution extends to infinity in both
directions, but we must be talking about a reasonably finite number of
packages.

23. Answer: C.

Explanation: For the zoo elephants, the total amount of food is (3
elephants)(150 pounds per day per elephant)(7 days) = 3150 pounds.
For the wild elephants, the total amount of food is (5 elephants)(315
pounds per day per elephant)(2 days) = 3150 pounds.

24. Answer: A.

Explanation: Do not calculate 7!, multiply it by 3!, etc. Instead, write out the factors and cancel factors found in both the numerator and denominator. For Column A: (7 x 6 x 5 x 4 x 3 x 2)(3 x 2)/(5 x 4 x 3 x 2)(2) =(7 x 6 x 3) = 126. For Column B: (5 x 4 x 3 x 2) = 120.

25. Answer: C.

Explanation: Evaluate each expression using FOIL. Note that the central terms drop out in each case. Don't neglect the external negative in Column B. Alternatively, multiply the second term in Column B by the leading -1, and you can rearrange to match Column A. No FOIL required!

26. Answer: B.

Explanation: First, note that the radius of the circle in A is 13, not 26. Its area will be $\pi 13^2 = 169\pi$. Do not calculate further; ignore the $\pi$, it will be a common factor for all the circles' areas. The area between the concentric circles (it may be helpful to draw a diagram) is $\pi\, 15^2 - \pi 6^2 = 225\pi - 36\pi = 189\pi$.

27. Answer: B.

Explanation: The total number of parts is 4 + 5 + 3 + 3 = 15. Red and blue account for 4 + 3 = 7 parts, and yellow accounts for 5. In three 5-pound bags, 7/15 of the total pounds are red and blue: (3 bags)(5 pounds per bag)(7/15) = 7 pounds. In five 5-pound bags, 5/15 of the total pounds are yellow: (5 bags)(5 pounds per bag)(5/15) = 8.3 pounds. Note that for comparison purposes, you can streamline the calculation by ignoring the weight of a bag (5 pounds) since it is a common factor.

28. Answer: C.

Explanation: Although the chart title encourages you to compare stores, the question asks you to compare months. Add November's Apple Street store sales (5 + 10 + 8) to the Maple Street store sales (2 + 9 + 6) to get 40. For December, Apple Street sold (4 + 11 + 8) and Maple Street sold (3 + 6 + 8) for a total of 40.

29 . Answer: A.

Explanation: By vertical angles, the angle opposite 80 is also 80, and their supplements at that intersection must both be 100. Since the lines m and n are parallel, the next clockwise adjacent angle to the 45 must also be 100. Since 45 + 100 + a = 180, a = 35.

30 . Answer: C.

Explanation: Careful: the names of the angles are not in alphabetical order when paired with the proportion (ha, ha):

$$\frac{b}{a} = \frac{2}{3}$$

So, $3b = 2a,$ or $b = \frac{2a}{3}.$

The other thing you know is that the angles are complementary, i.e. their measures sum to 90: a + b = 90. Now you have two simultaneous equations. Substituting,

$$a + \frac{2a}{3} = 90, \text{so } \frac{3a}{3} + \frac{2a}{3} = 90,$$

so 5a = 270, so $a = 54.$