College Placement

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Question: 1

Solve for the positive value of x:
$4x^2 + 7 = 43$

A. 4
B. 3
C. 2
D. 9

Answer: B

Explanation:
$4x^2 + 7 = 43$
Remember that when solving equations for variables, your goal is to isolate the variable, which in this case is x. Do so by performing the same operations on each side of the equation. For example, if you subtract 7 from the left side of the equation, you also have to subtract it from the right side. This keeps the equation balanced.
First subtract 7 from both sides:
$4x^2 + 7 - 7 = 43 - 7$
$4x^2 = 36$
Then divide both sides of the equation by 4:
$4x^2/4 = 36/4$
$x^2 = 9$
Take the square root of both sides. The square roots of 9 are 3 and -3. (The square root of x^2 is x.)Since this question asks for the positive value of x,
$x = 3$
If you are confused about the order of operations in this problem, read the following:
Note that when solving algebra problems, the most efficient method is reversing the order of operations. Doing so will isolate the variable that needs to be evaluated. For example, when we have
$4x^2 + 7 = 43$
the first thing to do is subtract 7 from each side. Taking care of the exponents or the multiplication first would be much more difficult, and wouldn't bring us closer to isolating the x.

Question: 2

Tom and Andy started the day with equal numbers of marbles.
At lunchtime, Tom lost half his marbles to Andy.
After school, he lost another 9 marbles to Andy.
At the end of the day, Andy had four times as many marbles as Tom.
How many marbles did they have altogether?

A. 64
B. 45
C. 180
D. 90

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Answer: C

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Explanation:
Let them both start with m marbles.
After lunch, Tom had 1/2m marbles and Andy had 3/2m marbles
After school, Tom had (1/2m – 9) marbles and Andy had (3/2m + 9)
But Andy then had four times as many as Tom.
∴ 4(1/2m – 9) = 3/2m + 9
\   2m – 36 = 3/2m + 9
\   2m – 3/2m = 9 + 36
\   1/2m = 45
\   m = 90
\   They had 180 marbles altogether.

Question: 3

A Mersenne number is a number of the form 2n – 1, where n is a positive integer.
For which of the following values of n is the Mersenne number not prime?

A. n = 2
B. n = 4
C. n = 5
D. n = 7

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Answer: B

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Explanation:
Substitute the given values for n into the equation 2n – 1, and see which of them is not prime:
n = 2 --> 22 – 1 = 4 – 1 = 3 - Prime
n = 4 --> 24 – 1 = 16 – 1 = 15 - Not prime (because 3*5 =15, so 15 has factors besides 1 and itself)
n = 5 --> 25 – 1 = 32 – 1 = 31 - Prime
n = 7 --> 27 – 1 = 128 – 1 = 127 - Prime
∴ n = 4, which produces a result that is not prime.

Question: 4

Which of the following is equal to a quarter of a million?

A. 25,000
B. 250,000
C. 2,500,000

D. 0.250000

Explanation:
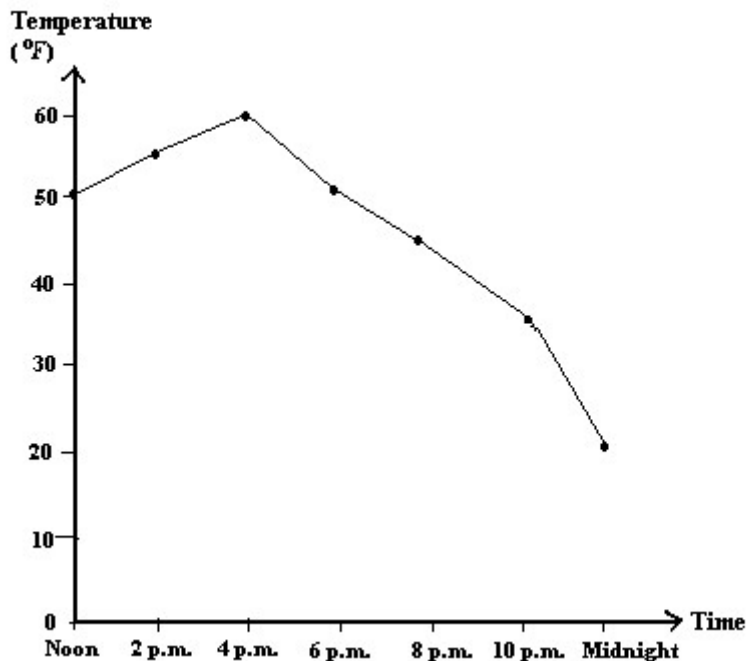A quarter in this context is the same as 25% or 1/4. So a quarter of a million is:
1/4 of 1,000,000 =
1/4 * 1,000,000 =
1,000,000/4 = 250,000.

Question: 5

The graph shows how the temperature recorded in a school laboratory changed during a twelve hour period from noon to midnight. What is the range of temperatures observed?

A. 30°F
B. 40°F
C. 45°F
D. 50°F

Answer: B

Explanation:
The range is defined to be the difference between the maximum temperature and the minimum temperature. The maximum temperature, 60°, is reached at 4pm. The minimum temperature, 20°, is reached at midnight.

∴ Range = 60°F − 20°F = 40°F

Question: 6

A solid is in the form of a prism with a square cross-section.
The volume, V, of the solid is in direct proportion to the square of one of its sides, x.
Given that V = 100 when x = 5, what is the value of V when x = 4?

A. 80
B. 64
C. 125
D. 1561/4

Answer: B

Explanation:
V is in direct proportion to x2 in this problem. That is, y is always equal to x2 times some constant. That means that as x2 varies, y varies in the same direction (e.g. as x2 increases, y increases), and the values of x2 and y can be plotted on a straight line. "Is in direct proportion to" can also be expressed as "varies directly with".
Step 1 Find the formula:
V is in direct proportion to the square of x ⇒ V μ x2 or V = kx2, where k is a constant.
Step 2 Find the value of k to get the exact formula relating y and x2.
It is given that V = 100 when x = 5
⇒ 100 = k * (5)2 = 25k
100 = 25k
⇒ k = 4
∴ V = kx2 = 4x2
Step 3 Find V when x = 4
V = 4x2 = 4 * 42 = 4 * 16 = 64
Another way to evaluate it:
 Recall that V is in direct proportion to x2.
So (x1)2/(x2)2 = V1/V2.
When x=5, x2 = 25. When x=4, x2 = 16. Set up a proportion with variable V2:
25/16 = 100/V2
Cross-multiply and solve:
25V2=1600
V2 = 64

Question: 7

Your monthly budget includes the following items:
$45 for telephone
$148 for utilities
$34 for car insurance.
What is the total of the three budget items?

A. $182
B. $227
C. $154
D. $454

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Answer: B

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Explanation:
To solve, add the 3 budget items together:
45 + 148 + 34 = $227

Question: 8

A distance of 0.234 meters is the same as

A. 2.34 kilometers
B. 234 millimeters
C. 2.34 centimeters
D. 0.00234 kilometers

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Answer: B

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Explanation:
In order to answer this question, you must know some facts about the metric system.
1 kilometer = 1000 meters or number of meters divided by 1000 equals number of kilometers
1 meter = 1000 millimeters or number of meters times 1000 equals number of millimeters
1000 millimeters = 100 centimeters = 10 decimeters = 1 meter
The number of meters should be converted into the other units.
0.234 meters * 100 = 23.4 centimeters
0.234 meters * 1000 = 234 millimeters
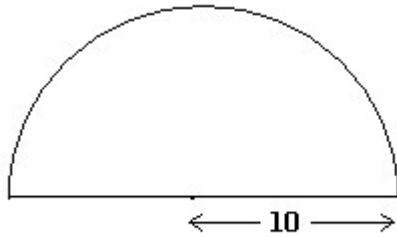Divide to find the number of kilometers:
0.234 meters / 1000 = 0.000234 kilometers
To verify: 0.234 meters = 234 millimeters = 23.4 centimeters = 0.000234 kilometers

Question: 9

The perimeter of the semicircle is:

A. (10π + 20) units
B. (5π + 20)units
C. (10π + 10) units
D. 50π units

Answer: A

Explanation:
The perimeter consists of a straight part and a curved part.
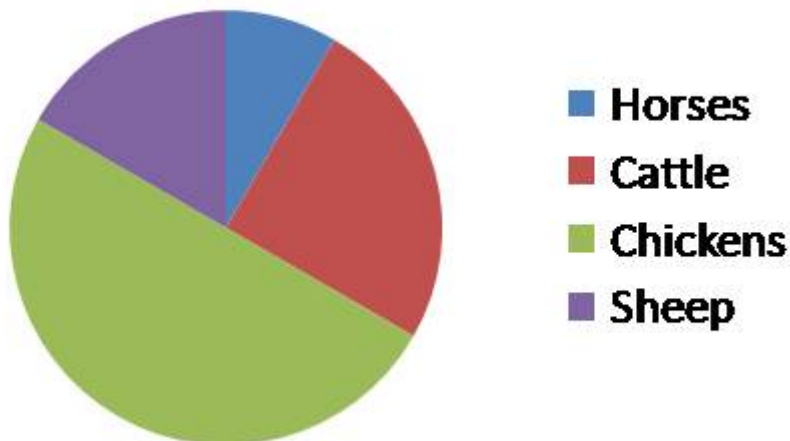Length of straight part = 2 * 10 = 20 units
Length of curved part = ½ * circumference of the circle = ½ * 2πr = πr = 10π units
Perimeter = (10π + 20) units

Question: 10

Regarding the pie chart, which statement about farm animals is most accurate?

A. The number of chickens is equal to the number of horses, cattle and sheep combined.
B. There are half as many chickens as cows.
C. There are as many horses as sheep.
D. None of the answers are correct.

Explanation:
In pie charts, the circle represents the total group of things being considered (here, animals). Each wedge represents a particular kind of thing (= a subgroup) within the whole group (e.g. chickens or sheep). The size of a wedge corresponds to the size of that subgroup in relation to the whole group. It appears that half the total pie chart is comprised of chickens, represented by the green wedge, which makes up half of the circle.   All the other animals combined make up the other half of the pie chart. This means that the number of chickens (half of the total group animals) is equal to the number of horses, cattle, and sheep combined (the other half of the total group animals).

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