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Question: 1

Simplify $\frac{x^6}{y^4} \times x^2y^3$.

a. x^4y
b. $\frac{x^4}{y}$
c. x^8y
d. $\frac{x^8}{y}$

Answer: D

Explanation:

To simplify, use the rules of exponents:

$$\begin{aligned}\frac{x^6}{y^4} \times x^2y^3 &= x^6y^{-4} \times x^2y^3 \\ &= (x^6x^2)(y^{-4}y^3) \\ &= x^{6+2}y^{-4+3} \\ &= x^8y^{-1} \\ &= \frac{x^8}{y}\end{aligned}$$

Question: 2

If $6q + 3 = 8q - 7$, what is q?

a. $-\frac{5}{7}$
b. $\frac{5}{7}$
c. 5
d. -7

Answer: C

Explanation:

Gather like terms and solve:

$$\begin{aligned}6q + 3 &= 8q - 7 \\ 6q - 8q &= -7 - 3 \\ -2q &= -10 \\ q &= 5\end{aligned}$$

Question: 3

Attending a summer camp are 12 six-year-olds, 15 seven-year-olds, 14 eight-year-olds, 12 nine-year-olds, and 10 ten-year-olds. If a camper is randomly selected to participate in a special event, what is the probability that he or she is at least eight years old?

a. $\frac{2}{9}$
b. $\frac{22}{63}$
c. $\frac{4}{7}$
d. $\frac{3}{7}$

Answer: C

Explanation:

The probability of an event is the number of possible occurrences of that event divided by the number of all possible outcomes. A camper who is at least eight years old can be eight, nine, or ten years old, so the probability of randomly selecting a camper at least eight years old is

$$\frac{\text{number of eight-, nine-, and ten-year-old campers}}{\text{total number of campers}} = \frac{14 + 12 + 10}{12 + 15 + 14 + 12 + 10} = \frac{36}{63} = \frac{4}{7}$$

Question: 4

A communications company charges \$5.00 for the first 10 minutes of a call and \$1.20 for each minute thereafter. Which of the following equations correctly relates the price in dollars, d, to the number of minutes, m (when $m \geq 10$)?

a. $d = 5 + 1.2m$
b. $d = 5 + 1.2(m - 10)$
c. $d = 5m + 1.2(m + 10)$
d. $d = (m + 10)(5 + 1.2)$

Answer: B

Explanation:

The charge is \$1.20 for each minute after the first ten minutes. The number of minutes after the first ten minutes is $m - 10$, so \$1.20 per minute charged for the part of the phone call exceeding 10 minutes is $1.2(m - 10)$. Adding this to the \$5.00 charge for the first ten minutes gives $d = 5 + 1.2(m - 10)$.

Question: 5

Employees of a small company work in one of three departments and are distributed as shown. Two employees are chosen randomly and independently to attend a conference. What is the probability that the pair chosen includes a woman from Department 1 AND a man from Department 2?

	Dept. 1	Dept. 2	Dept. 3	Total
Women	11	27	16	54
Men	19	15	12	46
Total	30	42	28	100

a. 1/30
b. 1/40
c. 1/50
d. 1/60

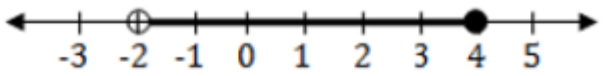
Answer: D

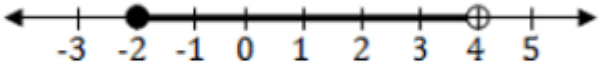
Explanation:

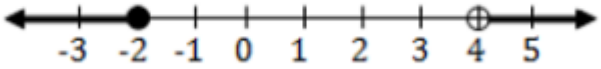
The probability of a woman from Department 1 being chosen is 11/100 and the probability of a man from Department 2 is 15/99, since there are only 99 employees left to choose from after the first employee has been selected. The probability of that pair being chosen is equal to the product of the two probabilities, since the picks are independent of one another. So, the product of the probabilities is $\frac{11}{100} \times \frac{15}{99} = \frac{165}{9900}$, which simplifies to 1/60.

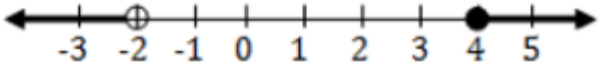
Question: 6

Which of the following graphs represents the inequality $-2 < x \leq 4$?

a.


b.


c.


d.


Answer: A

Explanation:

When graphing an inequality, a solid circle at an endpoint means that the number at that endpoint is included in the range, while a hollow circle means it is not. Since the inequality says that x is strictly greater than -2, the circle at —2 should be hollow. Since the inequality says that x is less than or equal to 4, the circle at 4 should be solid. —2 < x 4 indicates that x is between —2 and 4, so the area between the circles should be shaded.

Question: 7

The numbers of volunteers in different states (Texas and New Mexico) for 15 different events are shown in the table below. Which of the following statements is true?

TX	8	17	18	19	20	21	21	21	22	28	29	31	41	45	52
NM	7	11	15	29	30	30	31	33	34	36	37	42	44	44	45

a. The Texas data have a larger median and larger standard deviation.
b. The Texas data have a larger median and smaller standard deviation.
c. The Texas data have a smaller median and larger standard deviation.
d. The Texas data have a smaller median and smaller standard deviation.

Answer: C

Explanation:
The median number of volunteers in Texas is 21 and the median in New Mexico is 33. The standard deviation is a measure of variability or spread. Though standard deviation is not an easy measure of spread to quickly calculate, range is. The range of the values for Texas is slightly greater, hinting that the standard deviation should also be slightly larger for Texas. That is, in fact, the case. The correct answer is C.

Question: 8

Expand the following expression: $(x + 2)(x - 3) = ?$

a. $x^2 - 1$
b. $x^2 - 6$
c. $x^2 - x - 6$
d. $x^2 - 5x - 1$

Answer: C

Explanation:

A method commonly taught to multiply binomials is the FOIL method, an acronym for *first, outer, inner, last*: multiply the first terms of each factor, then the outer terms, then the inner terms, and finally, the last terms.

$$(x + 2)(x - 3)$$

$$(x)(x) + (x)(-3) + (2)(x) + (2)(-3)$$

From here, simplify and combine like terms.

$$x^2 - 3x + 2x - 6$$

$$x^2 - x - 6$$

Question: 9

Which of the following completely describes the number of points in which two distinct quadratic functions can intersect?

a. 2
b. 0 or 1
c. 1 or 2
d. 0, 1, or 2

Answer: D

Explanation:

It is certainly possible for two distinct quadratic functions to intersect at no points; one simple example is provided by the quadratic functions $y = x^2$ and $y = x^2 + 1$. For these to have an intersection would require a solution to the equation $x^2 = x^2 + 1$, which implies $0 = 1$, which is clearly impossible. It is also possible for two quadratic functions to intersect in exactly one point, if that point is the vertex of both quadratic functions; take for instance the quadratic functions $y = x^2$ and $y = -x^2$, which intersect only at the origin, (0, 0). Two distinct quadratic functions intersecting at a point other than a mutual vertex will intersect at two points; an example is the quadratic functions $y = x^2$ and $y = -x^2 + 2$, which will intersect at the points (1,1) and (−1,1).

Question: 10

$\log_5(5^3) =$

a. −2
b. 1
c. 3
d. 243

Answer: C

Explanation:

For any base b, $\log_b x$ and b^x are inverse functions, so $\log_b(b^x) = b^{\log_b x} = x$. In particular, then, $\log_5(5^3) = 3$.

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