Chapter 1. Language of Algebra

Ex. 1.9

Answer 1CU.

A circle graph compares parts of a set of data as a percent of the whole set.

A bar graph compares different categories of numerical information or data by showing each category as a bar whose length is related to the frequency.
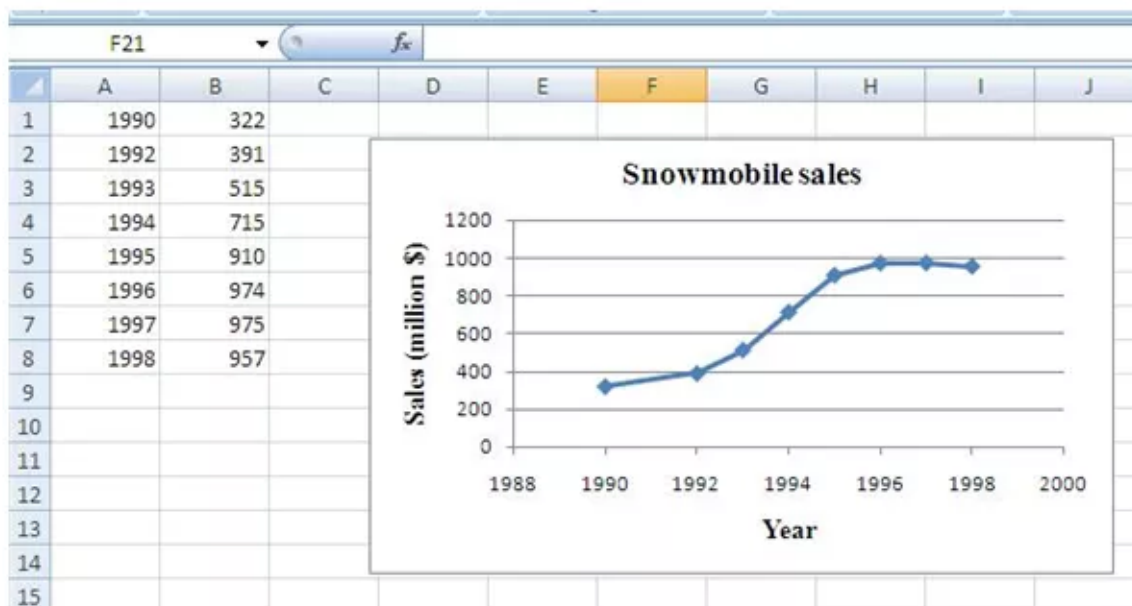
A line graph shows change in data over time.

Answer 1SI.

Enter the data in a spreadsheet. Use column A for the years and column B for the sales.

Now, select the data to be included in th graph. Then use the graph tool to create the graph. The line graph is shown below:

Answer 2SI.

Enter the data in a spreadsheet. Use column A for the years and column B for the sales.

Now, select the data to be included in th graph. Then use the graph tool to create the graph. The line graph is shown below:

Answer 3CU.

A circle graph compares parts of a set of data as a percent of the whole set.

The percents in a circle graph should always have a sum of 100%. A circle graph will be misleading if the $\boxed{\text{percentages of the data do not total 100}}$.

Answer 4CU.

The objective is to find the number of more schools participate in basketball than in golf.

The bar for basketball shows that the number of schools participating in basketball is 321.

The bar for golf shows that the number of schools participating in golf is 283.

The difference in the number of schools participating in basketball and golf is

$$321 - 283 = 38$$

Therefore, $\boxed{38}$ more schools participated in basketball than in golf.

Answer 5CU.

The objective is to identify the sport that is offered at the fewest schools.

The bar for Tennis shows that the number of schools participating in Tennis is 276, which is the fewest number of schools offering a sport.

Therefore, the sport that is offered at the fewest schools is $\boxed{\text{Tennis}}$.

Answer 6CU.

The number of students enrolled in colleges in 1999 is 14.9 million.

The objective is to find the number of students enrolled from Germany.

From the table, the percent of students enrolled from Germany is 0.06%.

To find the number of students enrolled from Germany, find 0.06% of 14.9 million.

$$0.06\% \text{ of } 14.9 \text{ million}$$
$$= \frac{0.06}{100}(14,900,000)$$
$$= 8940$$

Therefore, the number of students enrolled from Germany in 1999 is $\boxed{8,940}$.

Answer 7CU.

The number of students enrolled in colleges in 1999 is 14.9 million.

The objective is to find the number of more students enrolled from Canada than from United Kingdom.

From the table, the percent of students enrolled from Canada is 0.15%.

The percent of students enrolled from United Kingdom is 0.05%.

To find the number of more students enrolled from Canada then from United Kingdom, find $(0.15-0.05)\%$ of 14.9 million.

$(0.15-0.05)\%$ of 14.9 million

$= 0.10\% \cdot (14,900,000)$

$= \dfrac{0.10}{100} \cdot (14,900,000)$

$= 14,900$

Therefore, $\boxed{14,900}$ more students enrolled from Canada than from the United Kingdom in 1999.

Answer 8CU.

A circle graph compares parts of a set of data as a percent of the whole set.

The percents in a circle graph should always have a sum of 100%.

The sum of the percents of the data from the table is

$= 0.02 + 0.15 + 0.04 + 0.06 + 0.22 + 0.03 + 0.05$

$= 0.57$

As the sum of the percents is not 100%, it will $\boxed{\text{not be appropriate}}$ to display the data in a circle graph.

Answer 9CU.

A bar graph compares different categories of numerical information or data by showing each category as a bar whose length is related to the frequency. Also a bar graph is used to compare similar data in the same category.

A line graph shows change in data over time.

The above data from the table are of same category.

Thus, it would be appropriate to display the data on a $\boxed{\text{bar graph}}$ than a line graph.

Answer 10CU.

A bar graph compares different categories of numerical information or data by showing each category as a bar whose length is related to the frequency.

The above graph is misleading because on the vertical axis, the $\boxed{\text{scale starts from 10}}$. It should start from 0 only. Also no unit is given on the vertical axis.

Answer 11CU.

A bar graph compares different categories of numerical information or data by showing each category as a bar whose length is related to the frequency.

The above graph is misleading because on the vertical axis, the scale starts from 10. The $\boxed{\text{vertical axis needs to begin at 0}}$.

Answer 12PA.

From the table, the total cost of preparing one hour of 35-millimeter film is

$$\$(3110.40+621.00+1000.00+73.20)$$
$$=\boxed{\$4864.6}$$

Answer 13PA.

From the table, the total cost of preparing one hour of 35-millimeter film is

$$\$(3110.40+621.00+1000.00+73.20)$$
$$=\$4864.6$$

The total cost of preparing one hour of digital video is

$$\$(10+10)$$
$$=\$20$$

Now, divide 4864.6 by 20.

$$\frac{4864.6}{20}=243$$

Thus, the cost of using one hour of 35-millimeter film is about $\boxed{243 \text{ times}}$ as great as using digital video.

Answer 14PA.

From the figure, the percent of books purchased in the spring is 19%.

The number of books purchased in the spring is

19% of 25 million

$$=\frac{19}{100}(25000000)$$
$$=19(250000)$$
$$=475,0000$$

Therefore, the number of books purchased in the spring is $\boxed{475,0000}$.

Answer 15PA.

From the figure, the percent of books purchased in the summer is 15%.

The number of books sold during the summer is
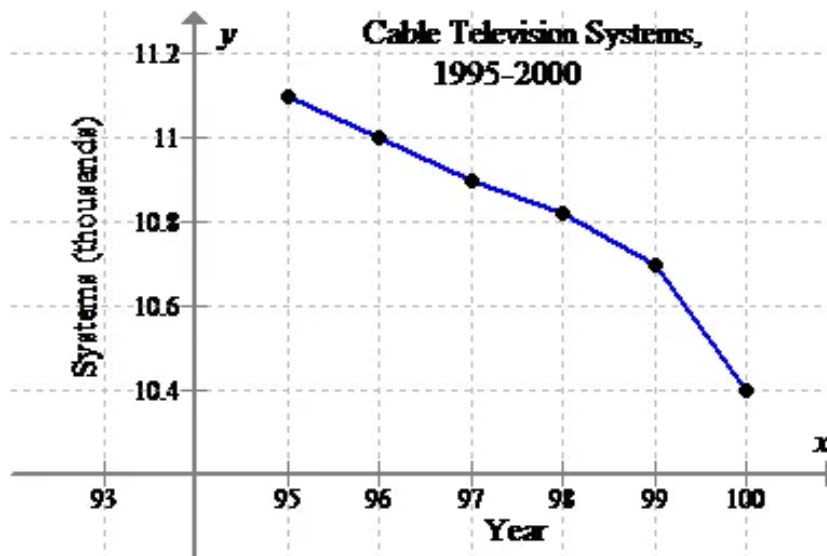
15% of 15,000

$$= \frac{15}{100}(15,000)$$

$$= 15(150)$$

$$= 2,250$$

Therefore, the number of books sold by the bookstore during the summer is $\boxed{2,250}$.
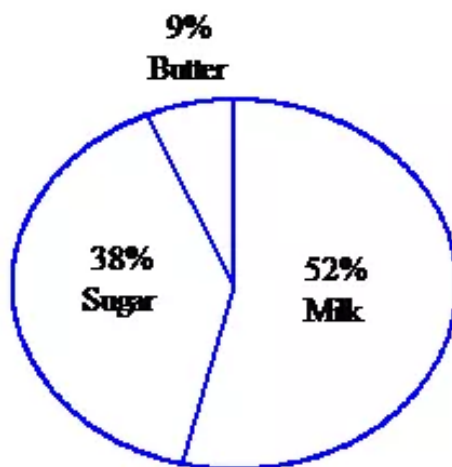
Answer 16PA.

Consider the following line graph showing the number of cable television systems in the United States from 1995 to 2000:

In the graph, the y-value starts from 10.2. The values below 10.2 are omitted, but no break is shown. Thus, the graph misrepresents the data.

Answer 17PA.

Consider the following graph showing favorite oatmeal toppings:

The objective is to check whether the graph is misleading or not.

The graph is misleading as the sum of the percentages is not 100. To fix the graph, each section must be drawn accurately and another section that represents "other" toppings should be added.
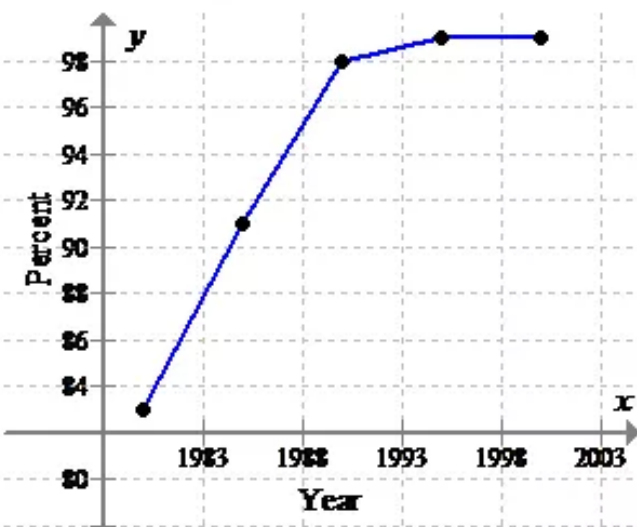
Answer 18PA.

To show little increase in ownership, increase the gap of the ticks on the *x*-axis and decrease the gap of the ticks on the *y*-axis.
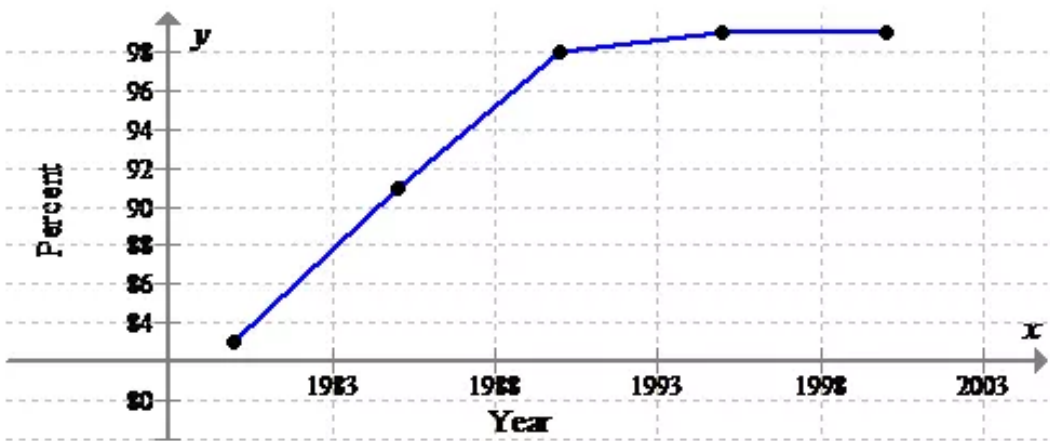
(b)

To show a rapid increase in ownership, increase the gap of the ticks on the *y*-axis and decrease the gap of the ticks on the *x*-axis.

(c)

Both the graphs are misleading as the tick values are not starting from 0. The vertical axis scale begins at 82 and the horizontal axis scale begins at 1978. The breaks are not shown on the graphs.

Answer 19PA.

The objective is to write the uses of graphs and tables.

Tables and graphs provide an organized and quick way to examine data. A graph allows to compare data visually. The tables examine the existing pattern and use it to continue a graph to the future. Line graphs are useful when showing how a set of data changes over time. These graphs can also be helpful to make predictions.

When making graph, make sure that the scale begins at zero and is consistent. Circle graphs should have all percents total 100%. The right kind of graph should be used for the given data.

Answer 20PA.

From the figure, the slope of the line joining the points against day 2 and day 3 is more than the other lines. This indicates that the greatest increase in temperature occurred between day 2 and 3.

Therefore, the correct option for the two days when the greatest increase in temperature occurred is (C) 2 and 3.

Answer 21PA.

Line graphs are useful when showing how a set of data changes over time.

For example, consider the following graph showing the average temperatures of some days:
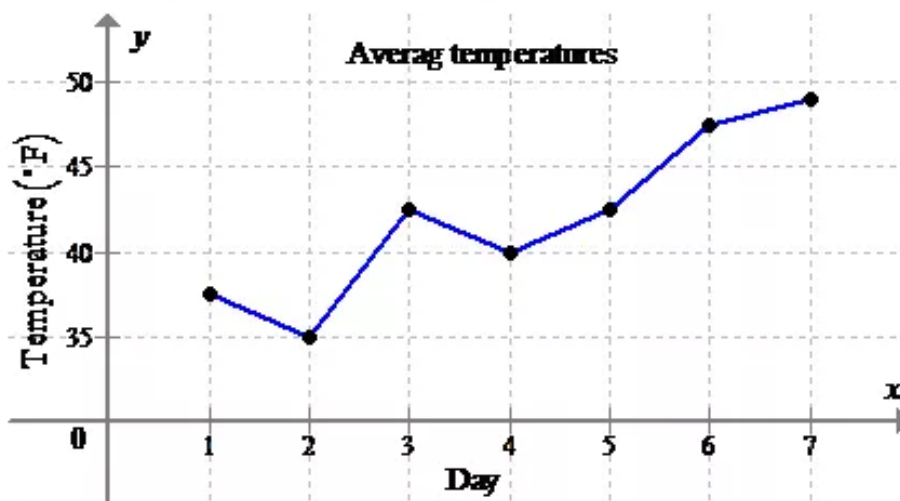
Therefore, the correct option for the graph that is primarily used to show the change in data over time is (C) line graph.

Answer 23MYS.

For $x = 12$,

$$4x - 5 = 4(12) - 5$$
$$= 43$$
$$> 12$$

Thus, the inequality $4x - 5 \leq 42$ does not hold true for $x = 12$.

Thus, a counterexample for the statement is $\boxed{x = 12}$.

Answer 24MYS.

For $x = 2$,

$$\frac{1}{x} = \frac{1}{2}$$
$$< 2$$

Thus, the inequality $x < \dfrac{1}{x}$ does not hold true for $x = 2$.

Thus, a counterexample for the statement is $\boxed{x = 2}$.

Answer 25MYS.

Let us assume that the length of the rectangle is 6 inches and the width is 2 inches.

Now, the perimeter is

$$(6 + 6 + 2 + 2) \text{ inches} = 16 \text{ inches}$$

Thus, it is not necessary that the length of each side should be 4 inches.

Thus, a counterexample to prove the statement as false is

$$\boxed{6 + 6 + 2 + 2 = 16}$$

Answer 26MYS.

Consider the expression $7a + 5b + 3b + 3a$.

The objective is to simplify the expression.

To simplify the expression, first use commutative property of addition: $a + b = b + a$.

$$7a + 5b + 3b + 3a$$

$$= 7a + 3a + 5b + 3b \text{ [Use commutative property of addition]}$$

$$= (7a + 3a) + (5b + 3b) \quad \left[\text{Use Associative property}: a + (b + c) = (a + b) + c\right]$$

$$= (7 + 3)a + (5 + 3)b \quad \left[\text{Use Distributive property}: (b + c)a = ba + ca\right]$$

$$= 10a + 8b \text{ [Use Substitution property; if } a = b \text{, then } a \text{ may be}$$

substituted for b]

Therefore, $7a + 5b + 3b + 3a = \boxed{10a + 8b}$.

Answer 27MYS.

Consider the expression $4x^2 + 9x + 2x^2 + x$.

The objective is to simplify the expression.

To simplify the expression, first use commutative property of addition: $a + b = b + a$.

$4x^2 + 9x + 2x^2 + x$

$= 4x^2 + 2x^2 + 9x + x$ [Use commutative property of addition]

$= (4x^2 + 2x^2) + (9x + x)$ $\left[\text{Use Associative property}: a + (b+c) = (a+b) + c\right]$

$= (4+2)x^2 + (9+1)x$ $\left[\text{Use Distributive property}: (b+c)a = ba + ca\right]$

$= 6x^2 + 10x$ [Use Substitution property; if $a = b$, then a may be

substituted for b]

Therefore, $4x^2 + 9x + 2x^2 + x = \boxed{6x^2 + 10x}$.

Answer 28MYS.

Consider the expression $\dfrac{1}{2}n + \dfrac{2}{3}m + \dfrac{1}{2}m + \dfrac{1}{3}n$.

The objective is to simplify the expression.

To simplify the expression, first use commutative property of addition: $a + b = b + a$.

$\dfrac{1}{2}n + \dfrac{2}{3}m + \dfrac{1}{2}m + \dfrac{1}{3}n$

$= \dfrac{2}{3}m + \dfrac{1}{2}m + \dfrac{1}{2}n + \dfrac{1}{3}n$ [Use commutative property of addition]

$= \left(\dfrac{2}{3}m + \dfrac{1}{2}m\right) + \left(\dfrac{1}{2}n + \dfrac{1}{3}n\right)$ $\left[\text{Use Associative property}: a + (b+c) = (a+b) + c\right]$

$= \left(\dfrac{2}{3} + \dfrac{1}{2}\right)m + \left(\dfrac{1}{2} + \dfrac{1}{3}\right)n$ $\left[\text{Use Distributive property}: (b+c)a = ba + ca\right]$

$= \left(\dfrac{4+3}{6}\right)m + \left(\dfrac{3+2}{6}\right)n$ [Simplify]

$= \dfrac{7}{6}m + \dfrac{5}{6}n$ [Use Substitution property; if $a = b$, then a may be

substituted for b]

Therefore, $\dfrac{1}{2}n + \dfrac{2}{3}m + \dfrac{1}{2}m + \dfrac{1}{3}n = \boxed{\dfrac{7}{6}m + \dfrac{5}{6}n}$.