1) Which of the following are positive? Indicate all correct answers.

- a) \((-5)^2 = 25\)
- d) \(8^{-1} = \frac{1}{8}\)

2) \(4.5 \times 10^7\) is how many times \(9 \times 10^{-4}\) ?

b) \(5.0 \times 10^{10}\)

\[
4.5 \times 10^7 \text{ divided by } 9 \times 10^{-4} = .5 \times 10^{11} \\
(\text{When you divide, you subtract the exponents. } 7 - (-4) = 11) \\
.5 \times 10^{11} = 5.0 \times 10^{10} \\
(\text{If we move the decimal 1 place to the right to put it into scientific notation, we must subtract 1 from the exponent.})
\]

3) There are \(z\) zebras and \(g\) giraffes in the zoo. If the number of giraffes is 12 more than twice the number of zebras, which of the following represents the number of zebras?

d) \(\frac{g - 12}{2}\)

\[
\text{Number of giraffes, } g, \text{ is } 12 + \text{ twice the number of zebras, } z.
\]

\[
g = 12 + 2z \quad \text{To find the number of zebras, solve this equation for } z.
\]

\[
g - 12 = 2z \quad \text{Now divide both sides by 2:}
\]

\[
\frac{g - 12}{2} = z
\]
4) There are 6 red marbles, 2 blue marbles, and x white marbles. If the probability of picking a white marble is $\frac{5}{8}$, what is the number of white marbles?

c) 10

There are 6 red, 2 blue, and x white for a total of 6 + 2 + x marbles.

Probability of picking white = $\frac{\text{number of white}}{\text{total}} = \frac{x}{6 + 2 + x} = \frac{x}{8 + x}$

$\frac{5}{9} = \frac{x}{8 + x}$  Now cross-multiply

$9x = 5(8 + x)$

$9x = 40 + 5x$

$4x = 40$

$x = 10$

5900 $\binom{2}{b^2}$ is equivalent to which of the following?

Indicate all such answers.

- a) $900a^2 - 900b^2$
- b) $900(a + b)(a - b)$
- d) $(30a)^2 - (30b)^2$

Use the distributive property to multiply:

$900(a^2 - b^2) = 900a^2 - 900b^2$

$a^2 - b^2$ factors into $(a + b)(a - b)$

so choice b is the same as a.

$(30a)^2 = 900a^2$ and $(30b)^2 = 900b^2$
6) Which are factors of any integer that is a multiple of both 7 and 20? Indicate all such answers.

- a) 5
  - 7 is a prime number
  - $20 = 4(5) = 2(2)(5)$
  - Any combination of 7(2)(2)(5) will work.
  - Ex. 2 or 5 or 7
  - or $7(2) = 14$ or $2(2) = 4$ not choices
  - or $2(5) = 10$ or $7(2)(2) = 28$
  - No combination of factors will give us 15 or 368.

- b) 10

- d) 28

7) Given the equation: $7x + 10 = 6 - x$
   
   Step 1: $8x = -4$
   
   Step 2: $x = -\frac{1}{2}$

   What was added to both sides to reach Step 1?

   b) $x - 10$

   To go from $7x + 10 = 6 - x$, you would need to add $x$ to both sides and subtract 10 from both sides. Normally, you would do that in two steps but they wanted to make it harder and put the two steps into one! (I don’t know why they have to make things so hard for us poor teachers!) Subtracting 10 is the same as “adding” a negative 10. Another way of putting that is you would add $x - 10$.

8) If $2 < a < 6$, $9 < b < 17$ and $c = b - a$, which of the following indicates all possible values of $c$?

- c) $7 < c < 15$
  
  The smallest value of $c$ would be $9 - 2 = 7$.
  
  The largest value of $c$ would be $17 - 2 = 15$.
  
  Therefore the range of possible values of $c$ is from 7 to 15.
9. Kara has to move 10 \( \frac{5}{6} \) pounds of manuals to her new house.

If each of the manuals weighs \( 2\frac{1}{6} \) pounds, how many manuals will she move?

\[
\frac{10}{6} \div \frac{2}{6} = \frac{65}{6} \div \frac{13}{6} = \frac{65 \cdot 6}{13} = \frac{65}{13} = 5
\]

\( \sqrt[3]{66}, \sqrt{26}, 4.51, \pi \)

10. Which of the following lists the numbers above in increasing order?

b) \( \pi, \sqrt[3]{66}, 4.51, \sqrt{26} \)

\[\pi = 3.14, \quad \sqrt[3]{66} \text{ is a little more than 4, \quad 4.51, \quad } \sqrt{26} = 5.09\]
(Remember, \( 4 \times 4 \times 4 = 64 \). Therefore \( 4^3 = 64 \) or \( \sqrt[3]{64} = 4 \) exactly.)

11. The length of a rectangular picture frame is 9 and the diagonal of the rectangular frame is 17. Which of the following is closest to the width of the frame?

c) 14.4

Draw a rectangle. Then use the good old Pythagorean Theorem.

\[
w^2 + 9^2 = 17^2 \\
w^2 + 81 = 289 \\
w^2 = 208 \\
w = \sqrt{208} \approx 14.4
\]
12) What is the value of \( j + k \) in the diagram above?

c) 82

13) If AC = 12, AD = 15, and AB = 17, approximately how much greater is BC than DC?

a) 3.04

Look at the large right triangle ABC. First find BC by using the Pythagorean Theorem:

\[
12^2 + x^2 = 17^2
\]

\[
144 + x^2 = 289
\]

\[
x^2 = 145
\]

\[
x = \sqrt{145} \approx 12.04 = BC
\]

Look at the smaller right triangle ADC. We can find DC by using multiples of the special 3 – 4 – 5 right triangle.

\[
x3 \quad x3 \quad x3
\]

\[
9 \quad 12 \quad 15
\]

So DC = 9

Finally, BC – DC = 12.04 – 9 = 3.04
14) Claire’s income this year is 12% less than it was last year. If she made $q$ dollars last year, which of the following indicates the amount she made this year?

**d) .88q**

If she made 12% less, then she made 100% - 12% = 88% of her salary = .88q

15) Which of the following would be the appropriate unit to measure the perimeter of your thumbnail?

**d) centimeters**

A kilometer is approximately .6 of a mile. That is too large.

Square units are used for area not perimeter.

One meter is approximately 3.3 ft. Again, too large.

That leaves the best choice – centimeters.

16) What is the probability that the spinner will land on a section labeled 3? Express your answer as a fraction.

\[
\frac{3}{8}
\]

**Probability landing on 3 = \frac{\# \text{ of sections with a 3}}{\text{total \# of sections}} = \frac{3}{8}**
17) If the circumference of the base of a hemisphere is 94.2 ft., what is the surface area of the hemisphere to the nearest square foot? (Surface area of a sphere is $4\pi r^2$.)

Did you notice they gave you the formula for a sphere? A hemisphere is half of a sphere so you need to use half of the formula $= 2\pi r^2$.

First we need to find the radius so we use the information: Circumference = 94.2. The formula for circumference = $2\pi r$.

\[
2\pi r = 194.2 \\
2(3.14)r = 94.2 \\
6.28r = 94.2 \\
r = 15
\]

Surface area of a hemisphere = $2\pi r^2$.

\[
2\pi r^2 = 2(3.14)(15)^2 = 1413
\]

18) A goat is tied to a stake in the ground with a rope of length 24 ft. What is the area of the circle in square feet the goat may walk in if he uses the entire length of the rope?

The length of the rope is equal to the radius of the circle.
Area of a circle = $\pi r^2$.

\[
(3.14)(24)^2 = 1808.6
\]
e) 1808.6

When a segment is rotated 180 degrees, it will form a straight line with the original segment.

To get from A to B, you can count up 5 and right 2. Just reverse that and from A, go down 5 and left 2 and you will land on (0, -4).

19) If segment AB is rotated 180° about A, what will be the new coordinates of point B?

d)(0, -4)
20) If 9 is added to each of the numbers above and then each of the resulting numbers is multiplied by 5, what will be the new range of the numbers?

\[
\begin{array}{ccc}
54 + 9 &=& 63 \\
63 \times 5 &=& 315 \\
2 + 9 &=& 11 \\
11 \times 5 &=& 55
\end{array}
\]

\[
\text{Range} = \text{largest} - \text{smallest}
\]

\[
315 - 55 = 260
\]

21) If \( f + g = 7 \), and \( p = 6(f - 2) + 2(7 + 3g) \), what is the value of \( p \)?

\[
p = 6(f - 2) + 2(7 + 3g)
\]

\[
p = 6f - 12 + 14 + 6g \\
\text{Combine: } -12 & 14 = 2
\]

\[
p = 6f + 6g + 2 \\
\text{Since } f + g = 7, 6f + 6g = 6(7) = 42
\]

\[
p = 42 + 2 \\
\text{Replace } 6f + 6g \text{ with } 42
\]

\[
p = 44
\]

22) Find the height of the figure above if the volume is equal to 1372. \( V = \frac{1}{3} hB \) where \( h \) represents the height and \( B \) represents the area of the base.

\[
B = \text{Area of the base} = 14(14) = 196
\]

\[
V = \frac{1}{3} hB
\]

\[
1372 = \frac{1}{3} h(196) \text{ multiply both sides by } 3
\]

\[
4116 = h(196) \text{ divide both sides by } 196
\]

\[
21 = h
\]
23) What is the measure of the smaller angle formed by the hands of a clock when it shows the time is 5 p.m.

a) 150

The clock = a circle = 360 degrees. 360 divided by 12 numbers = 30 degrees per section. From 12 p.m. to 5 p.m. = 5 sections = 5(30) = 150.

(The larger angle is 360 – 150 = 210.)

24) Tanner says that \((j - k)^2 \leq j^2 + k^2\). Which of the following values of \(j\) and \(k\) show that this is false?

\[\begin{array}{cc}
  j & k \\
  e) & -3 \quad 3
\end{array}\]

This is time consuming. It is a good one to skip & come back later.

Method 1: Substitute for \(j\) and \(k\) until you stumble across the right one!

\[\begin{align*}
  (j - k)^2 & \leq j^2 + k^2 & \text{Choice e) Replace } j \text{ with } -3 \text{ and } k \text{ with } 3. \\
  (-3 - 3)^2 & \leq (-3)^2 + (3)^2 \\
  (-6)^2 & \leq 9 + 9 \\
  36 & \leq 18 \text{ is false } \\
  36 & > 18
\end{align*}\]

Method 2: \((j - k)^2 = (j - k)(j - k) = j^2 - 1jk - 1jk + k^2 = j^2 + k^2 - 2jk\)

\[j^2 + k^2 - 2jk \leq j^2 + k^2 \text{ Subtract } j^2 \text{ & } k^2 \text{ from both sides.} \]

\[-2jk \leq 0 \text{ Now you only need to compare } -2jk \text{ to } 0.\]

OK, both methods are time consuming. So, skip it!
25) Which of the following tables satisfies the equation \( y = 3x + 5 \)?

<table>
<thead>
<tr>
<th>x</th>
<th>y</th>
</tr>
</thead>
<tbody>
<tr>
<td>-2</td>
<td>-1</td>
</tr>
<tr>
<td>-1</td>
<td>2</td>
</tr>
<tr>
<td>3</td>
<td>14</td>
</tr>
<tr>
<td>4</td>
<td>17</td>
</tr>
</tbody>
</table>

b) Just substitute the numbers in the table into the equation until you find a table that works for more than 1 pair of numbers!

\[
\begin{align*}
  y &= 3x + 5 \\
  -1 &= 3(-2) + 5 \, ? & y &= 3x + 5 \\
  2 &= 3(-1) + 5 \, ? & 14 &= 3(3) + 5 \, ? \\
  -1 &= -6 + 5 & 2 &= -3 + 5 & 14 &= 9 + 5 \\
  -1 &= -1 \, yes & 2 &= 2 \, yes & 14 &= 14 \, yes
\end{align*}
\]

26) If 358.76 is divided by 10, what number will be in the 10th place?

a) 8

358.76 divided by 10 is 35.876.
The number in the 10th place now is 8.

27) The ratio of the total membership of Gold’s gyms to Silver’s gyms is 18:5.
If Gold’s gym has 7.3 million members, approximately how many million members does Silver’s gym have?

c) 2

\[
\begin{align*}
G &= 18 \\
S &= 5 \\
\frac{18}{5} &= \frac{7.3}{x} \\
18x &= 36.5 \\
x &= 2.027
\end{align*}
\]

28) Lynn’s Mustang cost $38,000. If she made a down payment of $7,600, what percent of the cost remains to be paid?

d) 80%

10% of $38,000 = $3,800
20% of $38,000 = $7,600
So, she paid 20% and has 100% - 20% = 80% that remains to be paid
29) Rashida makes $700 per month plus x dollars for each house she sells. If P represents the total amount she made last month, which of the following represents the number of houses sold?

\[
\text{a) } \frac{P - 700}{x}
\]

We need to make up a new letter to represent the number of houses sold. Let's use \( H \).
Total = 700 + x(H)
\[ P = 700 + xH \]
Now, solve for \( H \).
\[ P - 700 = xH \]
Divide both sides by \( x \).
\[ \frac{P - 700}{x} = H \]

30) The area of a rectangle is 288 square inches. What is the area in square feet?

\[ \text{b) 2} \]

144 square inches = 1 square foot

288 square inches: 288 divided by 144 = 2 square feet

31) Triangles RSG and JFK are similar triangles. If RS = 8, SG = 14 and JF = 12, find the length of FK.

\[ \text{Similar triangles have sides that are in proportion. Write the equation:} \]
\[ \frac{8}{12} = \frac{14}{x} \]
\[ 8x = 168 \]
\[ x = 21 \]
32) \(8(x - 5) - 3(y + 8)\) is equivalent to which of the following?

\[
\begin{align*}
c) \quad 8x - 3y - 64 & \quad \begin{aligned}
8(x - 5) - 3(y + 8) & \quad \text{distribute} \\
8x - 40 - 3y - 24 & \quad \text{combine -40 & -24} \\
8x - 3y - 64 & \quad \text{add -40 & -24} 
\end{aligned}
\end{align*}
\]

33) Given the sequence: \(-\frac{1}{125}, \frac{1}{25}, \frac{1}{5}, \ldots\) Which of the following could be in the sequence?

\[
\begin{align*}
c) \quad 25 & \\
\frac{1}{5} \div \frac{1}{25} = \frac{-1}{5} \cdot \frac{25}{1} = \frac{-25}{5} = -5 \\
\text{Each term is -5 times the preceding term. Therefore, continue to multiply by -5:} \\
\frac{-1}{5}(-5) = 1 \quad 1(-5) = -5 \quad -5(-5) = 25 \\
\frac{1}{125}, \frac{1}{25}, \frac{1}{5}, 1, \quad -5, \quad 25, \quad -125, \quad 625
\end{align*}
\]

34) Dr. Gardner recorded the scores of her students on the Core test after they finished the Core class. The information is displayed above. What is the median of the grades on the Core test shown above?

\[
b) \quad 175
\]
35) Marymount University wants to take a survey of college student eating habits. In which location should the survey be given to make it statistically sound?

b) student center

The locker rooms will have athletes who most likely have good eating habits. The same is true with the health store. People in the clinic are sick and may not have good eating habits. The student center is the one place that has a variety of types of students to survey.

<p>| | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Ford</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nissan</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Peugeot</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chevy</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Each car represents 250 cars. Each half car represents half as many.

36) The pictograph above shows the sales of several types of cars. Based on this, the number of Fords and Nissans sold is how much greater than the number of Peugeots and Chevys sold?

Fords & Nissans are represented by a total of 7.5 pictures of cars. Peugeots & Chevys are represented by a total of 4.5 pictures of cars.

\[
7.5(250) = 1875 \\
4.5(250) = 1125 \\
1875 - 1125 = 750
\]

Of course, you can find out how many cars of each type are sold first and then figure it out but I like to use the pictures first. It’s faster!
37) A questionnaire was given out to two students. Aimee responded to all but 4 questions. Megan responded to all but 5 of the questions. If the total number of questions responded to is 61, how many questions are on the questionnaire?

Let $Q$ represent the number of questions on the questionnaire.
Aimee = $Q - 4$
Megan = $Q - 5$
$Q - 4 + Q - 5 = 61$
$2Q - 9 = 61$
$2Q = 70$
$Q = 35$

d) 35

38) If $k = 5 - 4p$ and $p = -2$, what is the value of $k$?

Replace $p$ with $-2$:
$k = 5 - 4(-2) = 5 + 8 = 13$

13

39) Which of the following shows the numbers above in increasing order?

c) $-6.01, -6, -\frac{17}{3}, \sqrt{50}$
$-6.01, -6, -5.67, 7.07$

40) Ty sold 200 hamburgers. One hundred and sixty hamburgers had catsup on them. Fifty-five had onions on them. Ten had neither catsup nor onions on them. How many hamburgers had both catsup and onions on them?

b) 25

$200 - 10$ with neither = 190 hamburgers
$160 + 55 = 215$ with either catsup or onions or both.
Only 190 had catsup or onions so subtract 190 from 215 to get the answer 25.
<table>
<thead>
<tr>
<th>Betty Bye</th>
<th>Barb Wire</th>
<th>Ella Vader</th>
<th>Carrie Ohkey</th>
<th>Jim Nasium</th>
</tr>
</thead>
<tbody>
<tr>
<td>12.1</td>
<td>11.9</td>
<td>14.2</td>
<td>14.9</td>
<td>10.7</td>
</tr>
</tbody>
</table>

41) The track team posted the times shown above. What is the mean of these times to the nearest 10th?

Add all the numbers together to get 63.8. Then divide by 5 people. The answer is 12.76 which is **12.8** to the nearest 10th.

42) Three hundred and twenty students from Gallaudet University are taking vans to George Mason University for the Core Praxis Workshop. Each van can hold thirty people. How many vans are needed?

**e) 11**

320 divided by 30 = 10.666 vans. Therefore, they will need **11** vans. I know – sometimes they throw you an easy one just to make you nervous.

43) What is the area of the figure above? (All angles are right angles.)

**a) 231**

You can divide the figure into 2 rectangles. (One way is show above). Since the right side of the larger rectangle is 9, the left side is also 9. Therefore, 12 – 9 = 3 for the width of the smaller rectangle.

Find the area of the 2 rectangles and then add them together. Area of a rectangle = length times width.

\[
\begin{align*}
3(5) + 9(24) &= 15 + 216 \\
&= 231
\end{align*}
\]
44) Which of the following expresses the relationship in the scatterplots above?

b) Graph 1 shows a strong negative correlation and graph 2 shows no correlation.

45) The graph above shows the relationship between studying and score on the Core test. Which of the following describes this relationship?

a) There is a strong positive correlation between studying and score on the Core test.

46) Which of the following is a statistical question?

b) How many years does an elephant live?

This is the only choice that may have more than one answer.
47) Jake paid $12,810 dollars for his car. After 6 years, the value of his car has depreciated to $5,124. Which of the following shows the ratio of his initial cost to the depreciated value after 6 years?

\[
\frac{\text{initial cost}}{\text{depreciated value}} = \frac{12810}{5124} = 2.5
\]

\[
2.5 = 2 \frac{1}{2} = \frac{5}{2} \quad \text{or} \quad 5 \text{ to } 2
\]

b) 5 to 2

48) A team of people, t, is made up of girls (g) and boys (b). There are three times as many boys as girls. Which of the following is a correct equation based on this information?

Let's pick easy numbers. Say we have 10 girls. Since there are 3 times as many boys then we have 3(10) or 30 boys. The team, t, total is 10 + 30 = 40 people

\[
a) \quad g = 3b \quad b) \quad t = g + 3b \quad c) \quad g = b - t \quad d) \quad g = 1/3t \quad \text{e) } \quad b = 3/4t
\]

Then “plug-in” the numbers in each example until you find one that is correct.

\[
a) \quad 10 = 3(30) \quad b) \quad 40 = 10 + 3(30) \quad e) \quad 30 = \frac{3}{4}(40)
\]

\[
10 = 90 \quad 40 = 100 \quad 30 = 30
\]

no \hspace{1cm} \text{no} \hspace{1cm} \text{YES}

49) Given the figure:

Then “flip” over the y-axis.

Rotate 90 degrees clockwise

Which of the following shows a rotation of 90 degrees clockwise followed by a reflection over the y-axis?

c)
50) In a special punch, 8 servings of punch requires $\frac{4}{5}$ cup of vodka. How many cups of vodka are required for one serving?

\[
\frac{\text{punch}}{\text{vodka}} = \frac{\text{punch}}{\text{vodka}}
\]
\[
\frac{8}{4} = \frac{1}{x} \quad \text{cross – multiply}
\]
\[
\frac{4}{5} \quad \text{Multiply both sides by } \frac{1}{8}
\]

(Dividing by 8 is the same as multiplying by $\frac{1}{8}$)

\[
\frac{1}{8}(8x) = \left(\frac{4}{5}\right) \cdot \frac{1}{8}
\]
\[
x = \frac{4}{40}
\]
\[
x = \frac{1}{10}
\]

\[\text{d) } \frac{1}{10}\]

51) In triangle ABC, AC = 18 and BC = 18. Which of the following is closest to the value of AB?

c) 25

Yes, you can use $a^2 + b^2 = c^2$. But, it's much faster if you remember the shortcut! In a right triangle, if the 2 legs are the same, then the longest side is the leg times $\sqrt{2}$. 

$18 \cdot \sqrt{2} \approx 25.4$
52) If John can travel $\frac{3}{5}$ a mile per minute, how many minutes will it take him to travel $2 \frac{1}{5}$ miles?

\[
\begin{align*}
\text{Change } 2\frac{1}{5} \text{ to } \frac{11}{5}. \\
\frac{\text{miles}}{\text{minutes}} = \frac{\text{miles}}{\text{minutes}} \\
\frac{3}{5} \times \frac{11}{5} = \frac{5}{x} \quad \text{cross-multiply} \\
3 \times \frac{11}{5} = \frac{5}{x} \\
\left(\frac{5}{3}\right)x = \frac{11}{5} \left(\frac{5}{3}\right) \\
x = \frac{11}{3} = \frac{32}{3}
\end{align*}
\]

53) Cindy graded creative writing papers for four straight days. She graded 7 papers the first day, 6 papers the second day, and 12 papers the third day. If she averaged nine papers per day, how many papers did she grade on the fourth day?

If she averaged 9 pages/day for 4 days she will have graded 9(4) = 36 papers.

\[36 - 7 - 6 - 12 = 11\] papers left to grade on the fourth day.

54) If the area of the shaded sector is $225\pi$, what is the circumference of the circle?

You need to have memorized the formula for area of a sector and circumference of a circle.

\[
\text{Area of sector} = \frac{n\pi \cdot r^2}{360}
\]

\[n = 90\] because of the right angle

\[225\pi = \frac{90\pi \cdot r^2}{360}\] Divide both sides by $\pi$ & reduce

\[225 = \frac{\pi r^2}{4}\] Multiply both sides by 4

\[4(225) = \left(\frac{\pi r^2}{4}\right)4\]

\[900 = \pi r^2\]

\[C = 2\pi r\]

\[C = 2(30)\pi\]

\[C = 60\pi\]
55) Given: 34, 38, 47, 49, 51. If the number “31” is added to this list as the sixth number, which of the following statements will be true.

a) The mean will decrease and the range will increase.

Adding a number lower than all the rest will decrease the average or mean. (You don’t actually have to find the mean!)

The range is the difference between the lowest and highest numbers. The old range was: $51 - 34 = 17$. The new range is $51 - 31 = 20$. Therefore, the range has increased. (You don’t actually have to find the range either. You can tell that $51 - 31$ will be more than $51 - 34$!)

---

56) In the triangle above, $x$ could be any number except:

$$9 - 9 < x < 9 + 9$$
$$0 < x < 18$$

The third side must be between 0 and 18. It cannot be equal to 18.