End-of-Year Test, Grade 7, Answer Key

If you are using this test to evaluate a student's readiness for Algebra 1, I recommend that the student score a minimum of 80% on the first four sections (Integers through Ratios, Proportions, and Percent). The subtotal for those is 120 points. A score of 96 points is 80%.

I also recommend that the teacher or parent review with the student any content areas in which the student may be weak. Students scoring between 70% and 80% in the first four sections may also continue to Algebra 1, depending on the types of errors (careless errors or not remembering something, versus a lack of understanding). Use your judgment.

You can use the last three sections to evaluate the student's mastery of topics in Math Mammoth Grade 7 Curriculum. However, mastery of those sections is not essential for a student's success in an Algebra 1 course.

The two geometry problems marked with an asterisk (*) are beyond the Common Core Standards for 7th grade.

A calculator is *not* allowed for the first three sections of the test: Integers, Rational Numbers, and Algebra.
A basic calculator *is* allowed for the last four sections of the test: Ratios, Proportions, and Percent; Geometry, Probability, and Statistics.

My suggestion for points per item is as follows.

Question #	Max. points	Student score
Integers		
1	2 points	
2	2 points	
3	2 points	
4a-f	6 points	
4g-i	6 points	
5	2 points	
6	2 points	
7	3 points	
	subtotal	/ 25
Rational Numbers		
8	3 points	
9	3 points	
10	4 points	
11	4 points	
12	6 points	
13	2 points	
14	4 points	
	subtotal	/ 26
Algebra		
15	6 points	
16	3 points	
17	8 points	
18	12 points	
19	2 points	
20	2 points	
21	4 points	
22a	2 points	
22b	1 point	
	subtotal	/ 40
Ratios, Proportions, and Percent		
23	4 points	
24a	1 point	
24b	2 points	
24c	1 point	
24d	1 point	
25a	1 point	
25b	2 points	
26	Proportion: 1 point Solution: 2 points	
27	2 points	
28	2 points	
29	2 points	
30	2 points	
31	2 points	
32	2 points	
33	2 points	
	subtotal	/ 29
SUBTOTAL FOR THE FIRST FOUR SECTIONS:		**/120**

Question #	Max. points	Student score
Geometry		
34a	2 points	
34b	2 points	
35	3 points	
36	2 points	
37a	2 points	
37b	2 points	
37c	1 point	
38	2 points	
39a	1 points	
39b	3 points	
40	2 points	
41	2 points	
42	3 points	
43a	2 points	
43b	2 points	
44	3 points	
45a	2 points	
45b	1 point	
46a	1 point	
46b	1 point	
47a	1 point	
47b	1 point	
	subtotal	/ 41

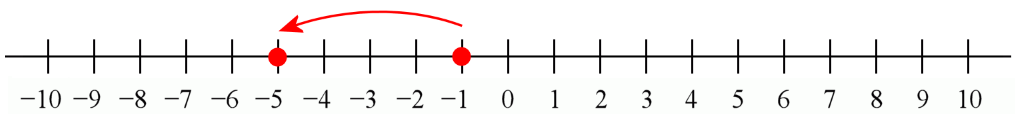
Question #	Max. points	Student score
Probability		
48	3 points	
49a	2 points	
49b	1 point	
49c	1 point	
49d	1 point	
50	3 points	
51	3 points	
	subtotal	/14
Statistics		
52	2 points	
53a	1 point	
53b	2 points	
53c	2 points	
54	2 points	
55a	1 point	
55b	1 point	
55c	1 point	
	subtotal	/12
SUBTOTAL FOR THE LAST THREE SECTIONS:		**/67**
TOTAL		**/187**

Integers

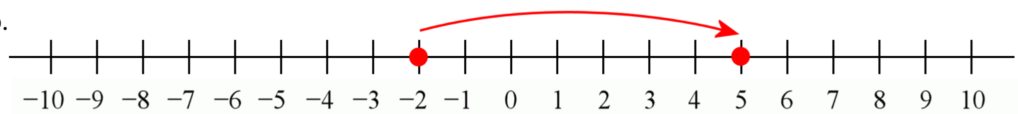
1. Answers will vary. Check the student's answer. −15 + 10 = −5. For example: A fish swimming at a depth of 15 ft rose 10 ft, and now it is 5 ft below the surface. Or, Mary owed her mom $15. She paid back $10 of her debt, and now she only owes her mom $5. Or, the temperature was −15°. It rose 10 degrees and now the temperature is −5°.

2. Answers will vary. Check the student's answer. 4 · (−2) = −8. For example: A certain ion has a charge of −2. Four such ions have a charge of −8. Or, four students bought ice cream for $2 each, but none of them had any money with them. Each of them borrowed $2 from a teacher. Now, their total debt is $8. Or, a stick reaches 2 m below the surface of the lake. If we put four such sticks end-to-end, they will reach to the depth of 8 m below the surface.

3. a.



b.



4. a. 2 b. −1 c. 25
d. 24 e. −12 f. 12
g. −44 − 20 = <u>−64</u> h. −16 + 36/(−9) = <u>−20</u> i. −1/2 + 10 = 9 1/2

5. | −5 − (−15) | = | 10 | = 10

6. The numbers could be: *a* = 8 and *b* = −7 or *a* = 7 and b = *−8.*

7. a. −1/8 b. −1/4 c. 4 1/5

Rational Numbers

8. a. 1748/10,000 b. −483/100,000 c. 2 43928/1,000,000

9. a. −0.0028 b. 24.93 c. 7.01338

10. a. 0.53846 b. $1.\overline{81}$

11.

a. 1.2 · 25 = 30
Answers will vary. Check the student's answer. For example:
The price of a pair of scissors costing $25 is increased by 20%. The new price is $30.
Or, a line segment that is 25 cm long is scaled by a scale factor 1.2, and it becomes 30 cm long.
Or, the lunch break, which used to be 25 minutes long, is increased by 1/5. Now it is 30 minutes long.

b. (3/5) ÷ 4 = (3/5) · (1/4) = 3/20.
Answers will vary. Check the student's answer. For example:
There is 3/5 of a large pizza left, and four people share it equally. Each person gets 3/20 of the original pizza.
Or, a plot of land that is 3/5 square mile is divided evenly into four parts. Each of the parts is 3/20 square mile = 15/100 sq. mi. = 0.15 sq. mi.

12.

a. $-\frac{2}{7}\cdot\left(-3\frac{5}{8}\right) = -\frac{2}{7}\cdot\left(-\frac{29}{8}\right) = \frac{1}{7}\cdot\frac{29}{4} = \frac{29}{28}$ $= \frac{1}{7}\cdot\frac{29}{4} = \frac{29}{28} = \mathbf{1\frac{1}{28}}$	b. $27.5 \div 0.6$ $= 275 \div 6$ $= \mathbf{45.8\overline{3}}$
c. $-0.7 \cdot 1.1 \cdot (-0.001)$ $= \mathbf{0.00077}$	d. $(-0.12)^2 = \mathbf{0.0144}$
e. $\dfrac{\frac{3}{4}}{\frac{5}{12}}$ $= \frac{3}{4}\cdot\frac{12}{5} = \frac{3}{1}\cdot\frac{3}{5} = \frac{9}{5} = \mathbf{1\frac{4}{5}}$	f. $\dfrac{5\frac{1}{2}}{-\frac{7}{8}}$ $= \frac{11}{2}\cdot\left(-\frac{8}{7}\right) = \frac{11}{1}\cdot\left(-\frac{4}{7}\right) = -\frac{44}{7} = \mathbf{-6\frac{2}{7}}$

13.

a. $-\frac{1}{6}\cdot 1.2$ If we use fraction arithmetic, this becomes: $= -\frac{1}{6}\cdot\frac{12}{10} = -\frac{1}{1}\cdot\frac{2}{10} = -\frac{2}{10} = -\frac{1}{5}$ If we use decimal arithmetic, we get $-\frac{1}{6}\cdot 1.2 = 1.2\cdot\left(-\frac{1}{6}\right) = 1.2 \div (-6) = -0.2$	b. $-\frac{2}{5} \div (-0.1)$ If we use decimal arithmetic, this becomes $-0.4 \div 0.1 = 4$ (because $4 \cdot 0.1 = 0.4$). With fraction arithmetic, we get $-\frac{2}{5} \div \left(-\frac{1}{10}\right) = \frac{2}{5}\cdot\frac{10}{1} = 4$

14.

a. $-\frac{1}{2} + \frac{5}{2}\cdot(-0.8) = -0.5 + 2.5\cdot(-0.8)$ $= -0.5 + (-2) = \mathbf{-2.5}$ Or, with fractions: $-\frac{1}{2} + \frac{5}{2}\cdot(-0.8)$ $= -\frac{1}{2} + \frac{5}{2}\cdot\left(-\frac{8}{10}\right) = -\frac{1}{2} + \frac{1}{1}\cdot\left(-\frac{4}{2}\right)$ $= -\frac{1}{2} + (-2) = -2\frac{1}{2}$	b. $\frac{5}{8}\cdot 0.4\cdot\left(-\frac{2}{3}\right) - 1.25$ $= \frac{5}{8}\cdot\frac{2}{5}\cdot\left(-\frac{2}{3}\right) - 1.25$ $= \frac{1}{4}\cdot\frac{1}{1}\cdot\left(-\frac{2}{3}\right) - 1.25 = -\frac{2}{12} - \frac{5}{4}$ $= -\frac{2}{12} - \frac{15}{12} = -\frac{17}{12} = -1\frac{5}{12}$

Algebra

15.

a. $15s - 10$	b. $5x^4$	c. $3a + 3b - 6$
d. $1.02x$	e. $2w - 4$	f. $-3.9a + 0.5$

16.

a. $7x + 14$ $= 7(x + 2)$	b. $15 - 5y$ $= 5(3 - y)$	c. $21a + 24b - 9$ $= 3(7a + 8b - 3)$

17.

a. $2x - 7 = -6$ | **+ 7** $2x = 1$ | **− 2** $x = 1/2$	b. $2 - 9 = -z + 4$ $-7 = -z + 4$ | **− 4** $-11 = -z$ | **÷ (−1)** $z = 11$
c. $120 = \frac{c}{-10}$ | **· (−10)** $-1200 = c$ $c = -1200$	d. $2(x + ½) = -15$ $2x + 1 = -15$ | **− 1** $2x = -16$ | **÷ 2** $x = -8$

18.

a. $\frac{2}{3}x = 266$ | **· 3** $2x = 798$ | **÷ 2** $x = 399$	b. $x + 1\frac{1}{2} = \frac{3}{8}$ | **− 1 1/2** $x = \frac{3}{8} - 1\frac{1}{2}$ $x = \frac{3}{8} - \frac{12}{8} = -\frac{9}{8} = -1\frac{1}{8}$
c. $-5y + 9y - 2 + y = 10$ $5y - 2 = 10$ | **+ 2** $5y = 12$ | **÷ 5** $y = 12/5$	d. $2(x + 7) - 3x = -36$ $2x + 14 - 3x = -36$ $14 - x = -36$ | **− 14** $-x = -50$ | **÷ (−1)** $x = 50$
e. $\frac{y + 6}{-2} = -10$ | **· (−2)** $y + 6 = 20$ | **− 6** $y = 14$	f. $\frac{w}{2} - 3 = 0.8$ | **· 2** $w - 6 = 1.6$ | **+ 6** $w = 7.6$

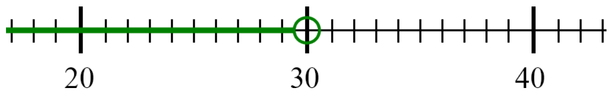
19. From the formula $d = vt$ we can find that $t = d/v$. In this case, t = 0.8 km/(12 km/h) = 0.8/12 hr = 8/120 hr = 1/15 hr = 1/15 hr · (60 min/hr) = <u>4 minutes</u>. This is reasonable because the distance he ran is fairly short.

20. Let x be the side of the regular hexagon. It is also the shorter side of the rectangle. Then, the perimeter is $6x + 30$. The equation is $6x + 30 = 72$, from which $6x = 42$ and $x = 7$. The side of the hexagon measures <u>7 units</u>.

21.

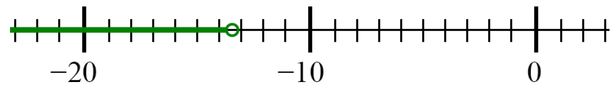
a.

$$\begin{aligned} 3x - 7 &< 83 && \mid +7 \\ 3x &< 90 && \mid \div 3 \\ x &< 30 \end{aligned}$$



b.

$$\begin{aligned} -2x - 16.3 &> 10.5 && \mid +16.3 \\ -2x &> 26.8 && \mid \div(-2) \\ x &< -13.4 \end{aligned}$$



22. a. Let n be the number of boxes. The cost of the boxes with the discount is $19n - 25$.
The inequality is $19n - 25 \le 170$. Solution:

$$\begin{aligned} 19n - 25 &\le 170 && \mid +25 \\ 19n &\le 195 && \mid \div 19 \\ n &\le 10.26 \end{aligned}$$

b. The solution means that you can buy 10 boxes at most.

Ratios, Proportions, and Percent

23.

a. Lily paid \$6 for 3/8 lb of nuts.

$$\frac{\$6}{\frac{3}{8}\text{ lb}} = \$6 \cdot \frac{8}{3}\text{ per lb} = \$16\text{ per lb}$$

b. Ryan walked 2 ½ miles in 3/4 of an hour.

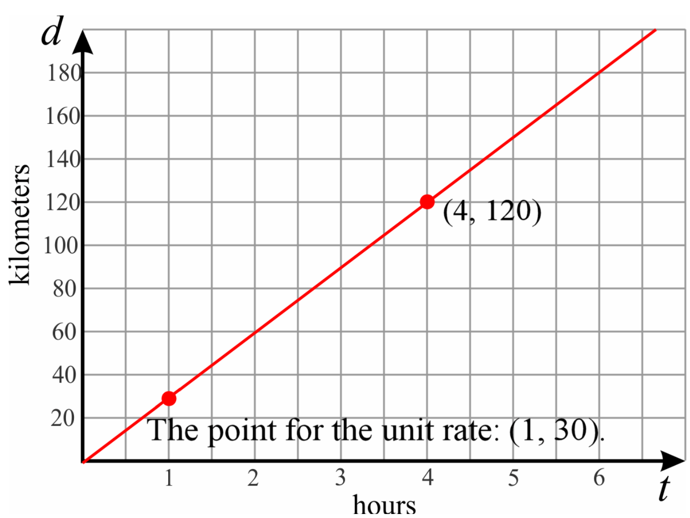
$$\frac{2\frac{1}{2}\text{ mi}}{\frac{3}{4}\text{ h}} = \frac{5}{2} \cdot \frac{4}{3}\text{ mi/h} = \frac{20}{6}\text{ mi/h} = 3\,\frac{1}{3}\text{ mi/h}$$

24. a. The speed of the moped is 30 km/h.

b. See the image on the right. The point is (4, 120), and it signifies that after driving 4 hours, the moped has covered 120 km.

c. $d = 30t$

d. See the image. It is the point (1, 30).



25. a. The Toyota Prius gets better gas mileage, because it gets 565 mi/11.9 gal ≈ 47.48 mi/gal whereas the Honda Accord gets 619 mi/17.2 gal ≈ 35.99 mi/gal.

b. The cost of driving 300 miles with a Toyota Prius is 300 mi · (11.9 gal/565 mi) · \$3.19/gal ≈ \$20.16.
The cost of driving 300 miles with a Honda Accord is 300 mi · (17.2 gal/619 mi) · \$3.19/gal ≈ \$26.59.
The difference is \$26.59 − \$20.16 = \$6.43.

26. Proportions vary as there are several different ways to write the proportion correctly. Here are four of the correct ways. Besides these four, you will get four more by switching the right and left sides of these four equations.

$$\frac{600\text{ ml}}{554\text{ g}} = \frac{5000\text{ ml}}{x} \qquad \frac{554\text{ g}}{600\text{ ml}} = \frac{x}{5000\text{ ml}} \qquad \frac{5000\text{ ml}}{600\text{ ml}} = \frac{x}{554\text{ g}} \qquad \frac{600\text{ ml}}{5000\text{ ml}} = \frac{554\text{ g}}{x}$$

The key point is that in each of the correct ways, *x* ends up being multiplied by 600 ml in the cross-multiplication. If *x* ends up being multiplied by 554 g or 5,000 ml in the cross-multiplication, the proportion is set up incorrectly.

Here is the solution process for one of the proportions above. Each of the others has the same final solution, <u>x = 4,617 g</u>.

$$\begin{aligned} \frac{600\text{ ml}}{554\text{ g}} &= \frac{5000\text{ ml}}{x} \\ 600\text{ ml} \cdot x &= 554\text{ g} \cdot 5000\text{ ml} \\ x &= \frac{554\text{ g} \cdot 5000\text{ ml}}{600\text{ ml}} \\ x &= 4{,}617\text{ g} \end{aligned}$$

27. a. These two quantities are *not* in proportion. For example, looking at the cost of potatoes for 5 lb and for 20 lb, the weight increases four-fold, but the cost increases about 3.5 times (from \$4.50 to \$16). Or, when the weight increases three-fold from 5 lb to 15 lb, the price does not increase three-fold, but from \$4.50 to \$13.

Another way to see that is in the beginning of the chart, the weights increase by 5 lb up to 20 lb, but the cost does not increase by the same amount. Instead, the cost increases first by \$4.50, then by \$4, then by \$3.

b. There is no need to answer this, since the quantities are not in proportion.

28. She can withdraw \$2,500 · 0.08 · 3 + \$2,500 = \$600 + \$2,500 = <u>\$3,100</u>.

29. Let p be the price of the gadget before the discount and the sales tax. Then, the price after the discount is $0.82p$ and the price after the sales tax is $1.055 \cdot 0.82p$. We get the equation

$$\begin{aligned} 1.055 \cdot 0.82p &= 51.82 \\ 0.8651p &= 51.82 \quad \Big| \; \div 0.8651 \\ p &= 59.90 \end{aligned}$$

The gadget cost \$59.90 before the discount and the sales tax.

30. After the 15% price increase, the ticket costs 1.15 · \$20 = \$23.
Then, the price decreased by 25% is 0.75 · \$23 = <u>\$17.25</u>.

31. Let p be the price of the mattress originally. Then, Margaret paid $0.8p - 30$. We get the equation:

$$\begin{aligned} 0.8p - 30 &= 144 \quad \Big| \; +30 \\ 0.8p &= 174 \quad \Big| \; \div 0.8 \\ p &= 217.5 \end{aligned}$$

The mattress cost \$217.50 originally,

32. Let r be the amount of rainfall in the previous month. Then, $1.35r$ = 10.5 cm, from which r = 10.5 cm/1.35 ≈ <u>7.8 cm</u>.

33. a. The percentage of increase was (72,000 − 51,500)/51,500 ≈ <u>39.8%</u>.

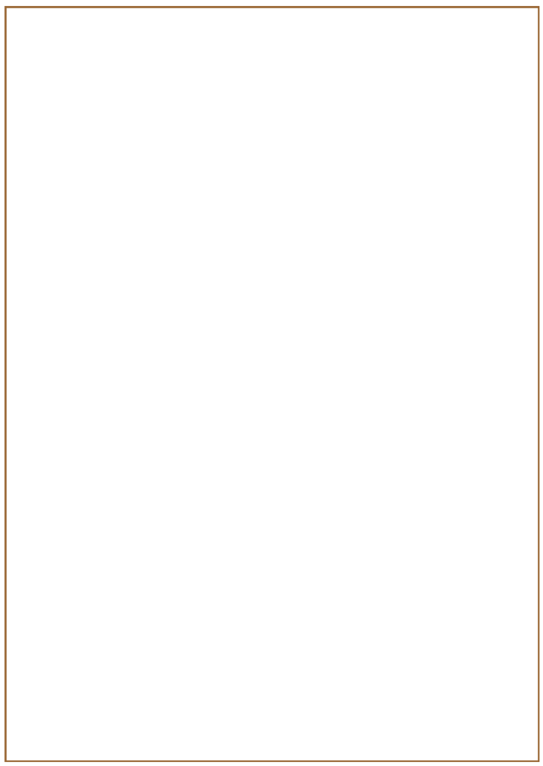
b. She will have 1.398 · 72,000 = 100,656 visitors ≈ <u>101,000 visitors</u>.

Geometry

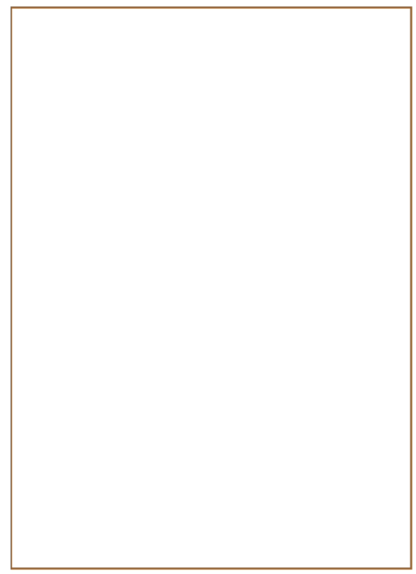
34. a. The given rectangle measures 7 cm by 10 cm. We multiply those by 45 to get the true dimensions:
7 cm · 45 = 315 cm = 3.15 m and 10 cm · 45 = 450 cm = 4.5 m.
The area is A = 3.15 m · 4.5 m = 14.175 m^2.

b. The dimensions of the room at a scale 1:60 will be 45/60 = 3/4 of the dimensions of the room drawn at a scale of 1:45 so the scale drawing will be smaller than the drawing given in the problem. The width is (3/4) · 7 cm = 5.25 cm and the height is (3/4) · 10 cm = 7.5 cm.

Or, you can divide the actual dimensions by 60 to get 315 cm ÷ 60 = 5.25 cm and 450 cm ÷ 60 = 7.5 cm.



Scale 1:45



Scale 1:60

35. We simply multiply the given dimensions (which are in inches) by the ratio 3 ft/1 in, essentially multiplying them by 3:

4 ¼ in · (3 ft/1 in) = 12 3/4 ft or 12 ft 9 in and

3 ½ in · (3 ft/1 in) = 10 ½ ft or 10 ft 6 in.

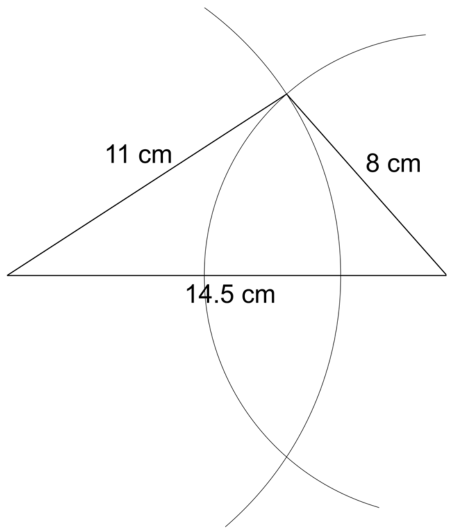
36. The side of the enlarged square is (4/3) · 15 cm = 20 cm. Its area is 20 cm · 20 cm = <u>400 cm</u>^{2}.

37. a. Area = $\pi \cdot (8\text{ cm})^2 \approx 201\text{ cm}^2$. Circumference = π · 16 cm ≈ <u>50.3 cm</u>.

b. The radius of this smaller circle is 0.8 · 8 cm = 6.4 cm. Its area = $\pi \cdot (6.4\text{ cm})^2 \approx 129\text{ cm}^2$.
Circumference = π · 12.8 cm ≈ <u>40.2 cm</u>.

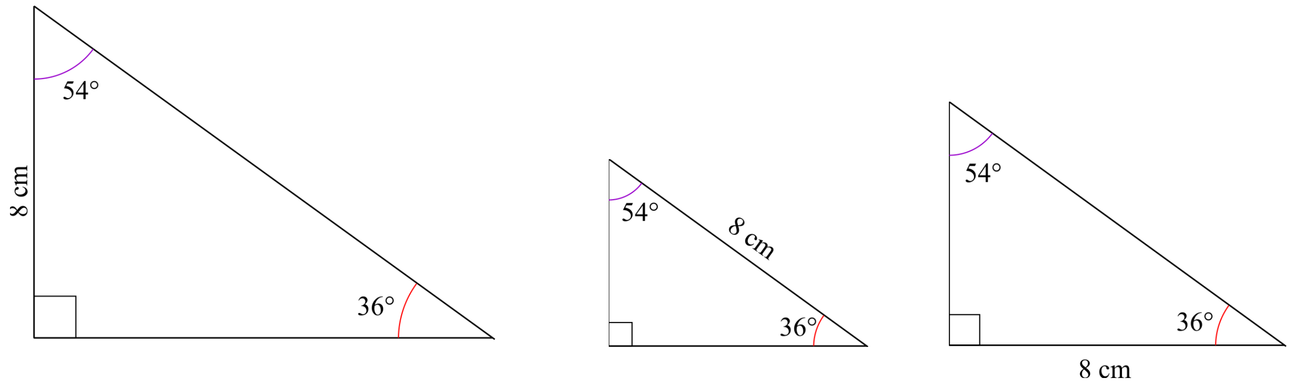
c. $$\frac{\pi \cdot (6.4\text{ cm})^2}{\pi \cdot (8\text{ cm})^2} = \frac{(6.4\text{ cm})^2}{(8\text{ cm})^2} = \frac{40.96\text{ cm}^2}{64\text{ cm}^2} = 0.64 = \underline{64\%}$$

38. Check the student's drawing. The image below is not to true scale, but the student's drawing of a triangle should have the same shape as the triangle below. It will just be larger.



39. a. No, it doesn't.

b. The three given angles determine the shape of the triangle. The 8-cm side can be opposite of any of the given angles, so we get three triangles of different sizes. The images below are not to true scale but are smaller than in reality. They give you an idea of what the three different triangles look like. Check the student's drawings.



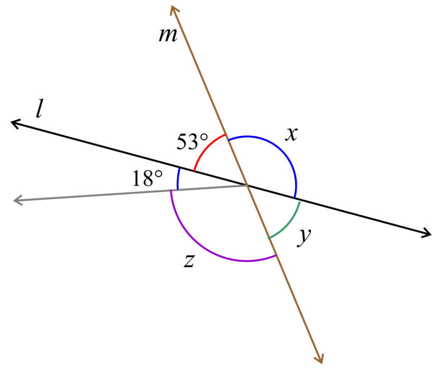
40.

$$\begin{aligned} 5x + 2x + 8x &= 360 \\ 15x &= 360 \quad \Big| \div 15 \\ x &= 24 \end{aligned}$$

The angles measure 5 · 24° = <u>120°</u>, 2 · 24° = <u>48°</u>, and 8 · 24° = <u>192°</u>.

41. a. There are several ways to write an equation for x.

(1) Since angle x and the 53° angle are supplementary, $x + 53° = 180°$, from which $x = 180° - 53° = 127°$.



(2) Angle y and the 53° angle are vertical angles, so $y = 53°$. Then, angle x and angle y are supplementary, so we can write the equation $x + 53° = 180°$, and once again $x = 180° - 53° = 127°$.

b. There are several ways to write an equation for z.

(1) Since angles y, z, and the 18° angle make a straight angle, their measures sum up to 180°, and we can write $y + z + 18° = 180°$. Since y and the 53° angle are vertical angles, $y = 53°$ and we can substitute that for y in the equation to get:

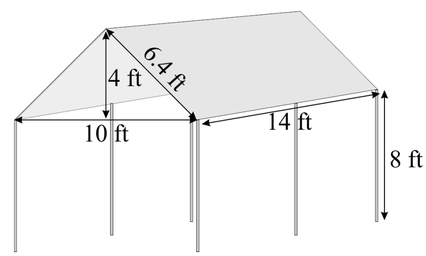
$$\begin{aligned} 53° + z + 18° &= 180° \\ z &= 180° - 53° - 18° \\ z &= 109° \end{aligned}$$

(2) Or, since the combination angle $z + 18°$ and x are vertical angles, $z + 18° = x$. From part (a) we know that $x = 127°$ so the equation becomes:

$$\begin{aligned} z + 18° &= 127° \\ z &= 127° - 18° \\ z &= 109° \end{aligned}$$

42. a. The cross section is a rectangle. b. The cross section is a triangle . c. The cross section is a trapezoid.

43. a. The roof or top part of the entire canopy is a triangular prism. The base of the prism is a triangle with a base side of 10 ft and a height of 4 ft, so its area is 10 ft · 4 ft / 2 = 20 ft^2.



The volume is $V = A_b \cdot h = 20\text{ ft}^2 \cdot 14\text{ ft} = 280\text{ ft}^3$.

b. The bottom part is a rectangular prism, and its volume is 10 ft · 14 ft · 8 ft = 1,120 ft^3.

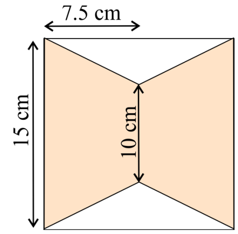
The total volume is 280 ft^3 + 1,120 ft^3 = 1,400 ft^3.

44. From the cube, we need to add the areas of the five square faces, plus half of the area of the top face: $A_{cube} = 5 \cdot 2 \cdot 2 + 2 \cdot 2 / 2 = 20 + 2 = 22$ square units

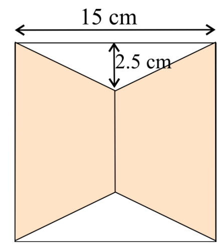
From the triangular prism, we will get the top face and three lateral faces.
The top face is a right triangle with 2-unit sides, so its area is 2 · 2 / 2 = 2 square units.
The three lateral faces have a total area of 2.8 · 2 + 2 · 2 + 2 · 2 = 5.6 + 4 + 4 = 13.6 square units.

In total, the surface area of the shape is 22 + 2 + 13.6 = 37.6 square units.

45. a. One way is to use the formula for the area of a trapezoid. See the image on the right.
The area of one trapezoid is A = (10 cm + 15 cm)/2 · 7.5 cm = 93.75 cm^2.
Then, the area of the two trapezoids is 2 · 93.75 cm^2 = 187.5 cm^2.



Another way is to subtract the area of the two white triangles from the area of the entire 15 cm by 15 cm square.



The area of one triangle is 15 cm · 2.5 cm/2 = 18.75 cm^2.
The area of the two trapezoids is then 15 cm · 15 cm − 2 · 18.75 cm^2 = 187.5 cm^2.

b. The trapezoids cover 187.5/(15 · 15) ≈ 83.3% of the entire square.

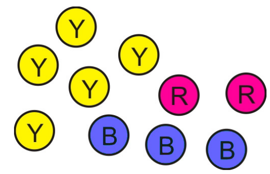
46. a. $V = A_b \cdot h = \pi \cdot (6\text{ cm})^2 \cdot 4.5\text{ cm} = 508.938\text{ cm}^3 \approx 509\text{ cm}^3$.

b. The volume is 509 ml = 0.509 L.

47. a. Since 1 ft = 12 in, 1 cubic foot has 12 in · 12 in · 12 in = <u>1,728 in</u>^{3}.

b. 3 ¼ ft = 3 · 12 in + 3 in = 39 in. The volume is V = (39 in)^3 = <u>59,319 in</u>^{3}.

Probability

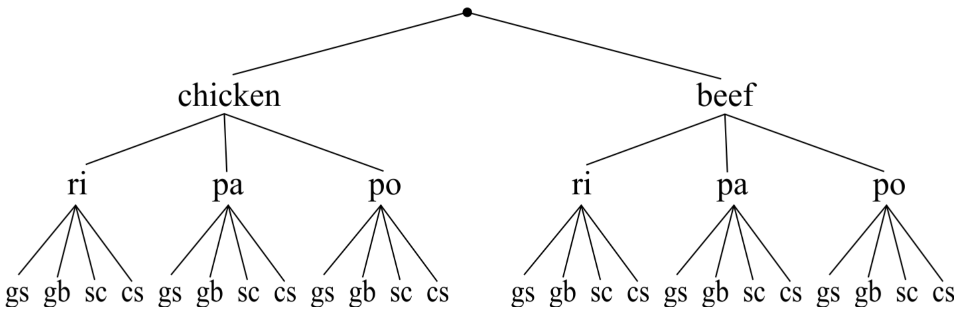


48. a. P(not red) = 8/10 = 4/5

b. P(blue or red) = 5/10 = 1/2

c. P(green) = 0

49. a.

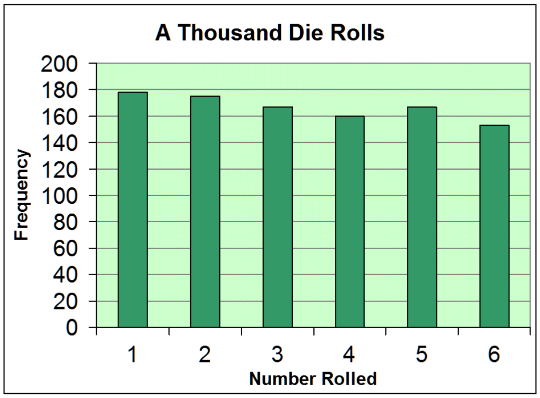


b. P(beef, rice, coleslaw) = 1/24

c. P(no coleslaw nor steamed cabbage) = 12/24 = 1/2

d. P(chicken, green salad) = 3/24 = 1/8

50. None of the conclusions (a), (b), or (c) are valid.



(a) This die is unfair.

Not valid. In a repeated random experiment, the frequencies for the various outcomes do vary, and the variability seen in the chart is definitely within normal variation. In fact, the data comes from running a computer simulation that uses random numbers, and the simulation was run 1,000 times.

(b) On this die, you will always get more 1s than 6s.

Not valid. The die is not necessarily unfair. A normal die could produce the frequencies seen in the chart.

(c) Next time you roll, you will not get a 4.

Not valid. Rolling a die is a random experiment and you might get 4 the next time you roll.

51. Answers will vary; check the student's answer. We can toss 10 coins (or a single coin 10 times) to simulate 10 children being born. Let heads = girl, and tails = boy (or vice versa).

Then, repeat that experiment (tossing 10 coins) hundreds of times. Observe how many of those repetitions include 9 heads and one tail , which means getting 9 girls and one boy. The relative frequency is the number of times you got 9 heads and one tail divided by the number of repetitions, and gives you an approximate value for the probability of 9 girls and 1 boy in 10 births.

Statistics

52. Cindy's sampling method is biased. She chose students from her class, which means that all the other students in the college didn't have a chance to be selected in her sample. For a sampling method to be unbiased, every member of the population has to have an equal chance of being selected in the sample. (Her method would work if she was only studying the students in her class.)

53. Four people are running for mayor in a town of about 20,000 people. Three polls were conducted, each time asking 150 people who they would vote for. The table shows the results.

	Clark	**Taylor**	**Thomas**	**Wright**	**Totals**
Poll 1	58	19	61	12	150
Poll 2	68	17	56	9	150
Poll 3	65	22	53	10	150

a. Based on the polls, we can predict Clark to be the winner of the election. He is leading in two of the three polls.
b. To estimate how many votes Thomas will get, use the average percentage of votes he got in the three polls. You can calculate that as ((61 + 56 + 53) ÷ 3)/150 or as (61/150 + 56/150 + 53/150) ÷ 3. Either way, you will get 37.78%. This gives us the estimate that he would get 0.3778 · 8,500 ≈ 3,200 votes in the actual election.
c. We will gauge how much off the estimate of 3,200 votes is by using the individual poll results.
Based on poll 1, we would estimate Thomas to get (61/150) · 8,500 ≈ 3,460 votes.
Based on poll 2, we would estimate Thomas to get (56/150) · 8,500 ≈ 3,170 votes.
Based on poll 3, we would estimate Thomas to get (53/150) · 8,500 ≈ 3,000 votes.

Looking at the highest and lowest numbers (3,000 and 3,460), we can gauge that our estimate of 3,200 votes might be off by a few hundred votes.

54. The total number of people Gabriel surveyed is 45 + 57 + 18 = 120. Of those, 45/120 = 37.5% support building the highway.

This gives us the estimate that 0.375 · 2,120 = 795 ≈ 800 households in the community would support building the highway.

Opinion	**Number**
Support the highway	45
Do not support it	57
No opinion	18

55. a. Chickens in Pasture 1 appear to weigh more. The median for this flock is 2.1 kg versus the median of about 1.96 kg for the chickens in Pasture 2.
b. The interquartile ranges for both groups are similar. Also, the ranges are similar. So, the weights of chickens seem to vary about the same amount in either flock.
c. Yes, chickens on Pasture 1 are significantly heavier than the chickens on Pasture 2.

The median for Pasture 1 is 2.1 kg and for Pasture 2, about 1.96 kg — a difference of about 0.14 kg. The interquartile ranges are about 0.13 kg for both Groups. The difference in the medians (about 0.14 kg) is more than one time the interquartile range (about 0.13). You can also see that visually. These are the entire populations (not samples), therefore the difference is significant.