

Math Mammoth End-of-the-Year Test - Grade 7

Integers

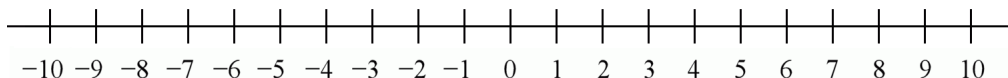
A calculator is not allowed for the problems in this section.

1. Give a real-life situation for the sum $-15 + 10$.

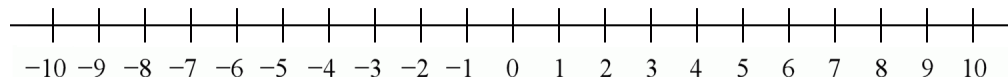
2. Give a real-life situation for the product $4 \cdot (-2)$.

3. Represent the following operations on the number line.

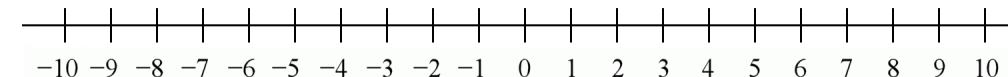
a. $-1 - 4$



b. $-2 + 7$



c. $-2 + (-7)$



4. Solve.

a. $-13 + (-45) + 60 = \underline{\hspace{2cm}}$

b. $-8 - (-7) = \underline{\hspace{2cm}}$

c. $2 - (-17) + 6 = \underline{\hspace{2cm}}$

d. $-3 \cdot (-8) = \underline{\hspace{2cm}}$

e. $48 \div (-4) = \underline{\hspace{2cm}}$

f. $(-2) \cdot 3 \cdot (-2) = \underline{\hspace{2cm}}$

5. The expression $|20 - 31|$ gives us the distance between the numbers 20 and 31.
Write a similar expression for the distance between -5 and -15 and simplify it.

6. Divide. Give your answer as a fraction or mixed number in lowest terms.

a. $1 \div (-8)$

b. $-4 \div 16$

c. $-21 \div (-5)$

Rational Numbers

A calculator is not allowed for the problems in this section.

7. Multiply and divide. For problems with fractions, give your answer as a mixed number in lowest terms.

a. $-\frac{2}{7} \cdot \left(-3\frac{5}{8}\right)$

b. $27.5 \div 0.6$

c. $-0.7 \cdot 1.1 \cdot (-0.001)$

d. $(-0.12)^2$

e. $\frac{\frac{3}{4}}{\frac{5}{12}}$

f. $\frac{5\frac{1}{2}}{-\frac{7}{8}}$

g. $-\frac{1}{6} \cdot 1.2$

h. $-\frac{2}{5} \div (-0.1)$

8. Write the decimals as fractions.

a. 0.1748	b. -0.00483	c. 2.043928
------------------	--------------------	--------------------

9. Write the fractions as decimals.

a. $-\frac{28}{10,000}$	b. $\frac{2,493}{100}$	c. $7\frac{1338}{100,000}$
--------------------------------	-------------------------------	-----------------------------------

10. Convert to decimals. If you find a repeating pattern, give the repeating part. If you don't, round your answer to five decimals.

a. $\frac{7}{13}$	b. $1\frac{9}{11}$
--------------------------	---------------------------

11. Give a real-life context for each multiplication or division. Then solve.

a. $1.2 \cdot 25$
b. $(3/5) \div 4$

Algebra

A calculator is not allowed for the problems in this section.

12. Simplify the expressions.

a. $7s + 2 + 8s - 12$	b. $x \cdot 5 \cdot x \cdot x \cdot x$	c. $3(a + b - 2)$
d. $0.02x + x$	e. $1/3(6w - 12)$	f. $-1.3a + 0.5 - 2.6a$

13. Factor the expressions (write them as multiplications).

a. $7x + 14$ =	b. $15 - 5y$ =	c. $21a + 24b - 9$ =
--------------------------	--------------------------	--------------------------------

14. Solve the equations.

a. $2x - 7 = -6$	b. $2 - 9 = -z + 4$
c. $120 = \frac{c}{-10}$	d. $2(x + \frac{1}{2}) = -15$
e. $\frac{2}{3}x = 266$	f. $x + 1\frac{1}{2} = \frac{3}{8}$

15. Chris can run at a constant speed of 12 km/h. How long will it take him to run from his home to the park, a distance of 0.8 km?

Remember to check that your answer is reasonable.

16. a. Which equation matches the situation?

A pair of binoculars is discounted by $\frac{1}{5}$ of their original price (p), and now they cost \$48.

$$\frac{w}{5} = 48$$

$$\frac{4w}{5} = 48$$

$$\frac{5w}{4} = 48$$

$$w - \frac{1}{5} = 48$$

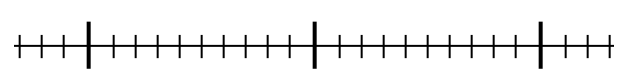
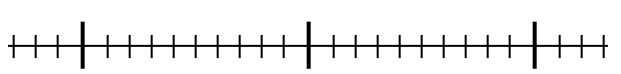
$$w - \frac{4}{5} = 48$$

$$5w - 4 = 48$$

- b. Solve the equation to find the original price of the binoculars.

17. The perimeter of a rectangle is 254 cm. Its length is 55 cm. Represent the width of the rectangle with a variable and write an equation to solve for the width. Then solve your equation.

18. Solve the inequalities and plot their solution sets on a number line. Write appropriate multiples of ten under the bolded tick marks (for example, 30, 40, and 50).

<p>a. $3x - 7 < 83$</p>  <p>A horizontal number line with 100 small tick marks. There are three bolded tick marks at the 10th, 40th, and 70th positions from the left.</p>	<p>b. $2x - 16.3 \geq 10.5$</p>  <p>A horizontal number line with 100 small tick marks. There are three bolded tick marks at the 10th, 40th, and 70th positions from the left.</p>
--	--

19. You need to buy canning jars. They cost \$15 a box, and you only have \$150 to spend. You also have a coupon that will give you a \$25 discount on your total. How many boxes can you buy at most?

a. Write an inequality for the problem and solve it.

b. Describe the solution of the inequality in words.

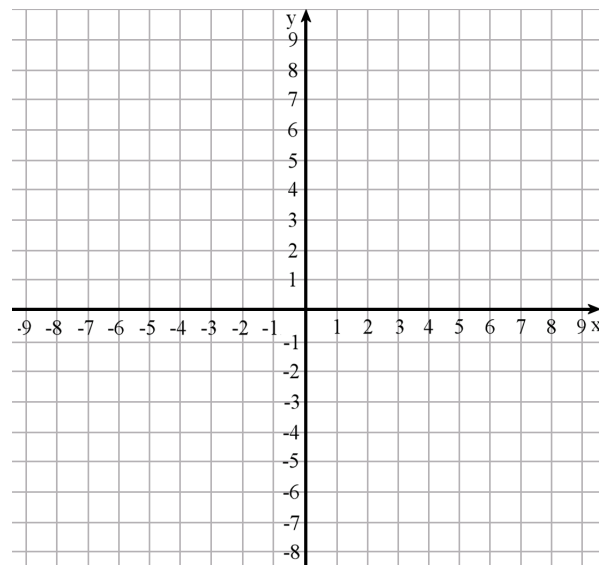
20. *Solve.

<p>a. $9y - 2 + y = 5y + 10$</p>	<p>b. $2(x + 7) = 3(x - 6)$</p>
<p>c. $\frac{y + 6}{-2} = -10$</p>	<p>d. $\frac{w}{2} - 3 = 0.8$</p>

21. *Draw a line that has a slope of $\frac{1}{2}$ and that goes through the point $(0, 4)$.

22. **a.** *Draw the line $y = -2x + 1$.

b. *What is its slope?



Ratios, Proportions, and Percent

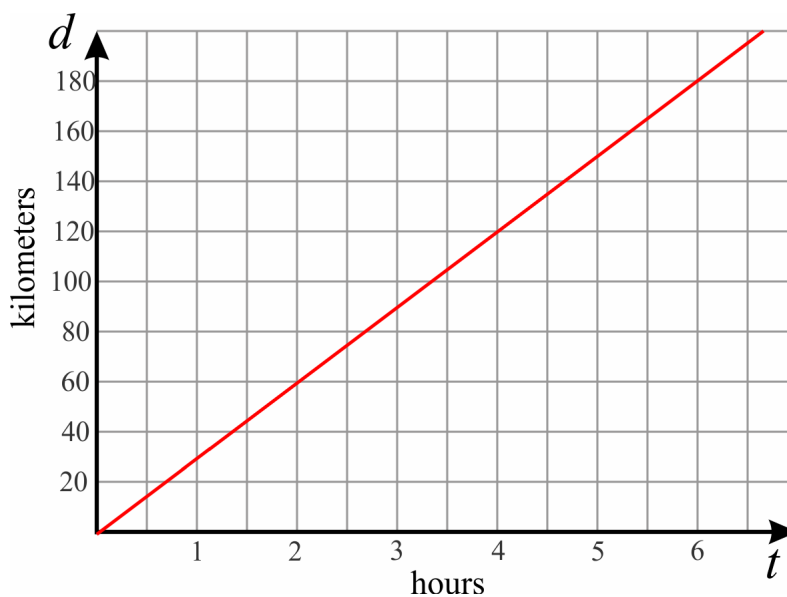
You may use a basic calculator for all the problems in this section.

23. (1) Write a unit rate as a complex fraction. (2) Then simplify it. Be sure to include the units.

a. Lily paid \$6 for $\frac{3}{8}$ lb of nuts.

b. Ryan walked $2\frac{1}{2}$ miles in $\frac{3}{4}$ of an hour.

24. The graph below shows the distance covered by a moped advancing at a constant speed.



- What is the speed of the moped?
- Plot on the line the point that corresponds to the time $t = 4$ hours.
What does that point signify in this context?
- Write an equation relating the quantities d and t .
- Plot the point that corresponds to the unit rate in this situation.

25. A Toyota Prius is able to drive 565 miles on 11.9 gallons of gasoline (highway driving). A Honda Accord can drive 619 miles on 17.2 gallons of gasoline (highway driving). (Source: Fueleconomy.gov)
- Which car gets better gas mileage?
 - Calculate the difference in costs if you drive a distance of 300 miles with each car, if gasoline costs \$3.19 per gallon.
26. Sally deposits \$2,500 at 8% interest for 3 years.
How much can she withdraw at the end of that period?
27. A ticket to a fair initially costs \$10. The price is increased by 15%. Then, the price is decreased by 25% (from the already increased price). What is the final price of the ticket?
28. In December, Sarah's website had 72,000 visitors. In December of the previous year it had 51,500 visitors.
- Find the percentage of increase to the nearest tenth of a percent in the number of visitors her website had for that year.
 - If the number of visitors continues to grow at the same rate, about how many visitors (to the nearest thousand) will her site have in December of the following year?
29. Alex measured the rainfall on his property to be 10.5 cm in June, which he calculated to be a 35% increase compared to the previous month. How much had it rained in May?

30. A square with sides of 15 cm is enlarged in a ratio of 3:4. What is the area of the resulting square?

31. How long is a distance of 8 km if measured on a map with a scale of 1:50,000?

32. Write a proportion for the following problem and solve it.

600 ml of oil weighs 554 g.

How much would 5 liters of oil weigh?

$$\text{_____} = \text{_____}$$

33. A farmer sells potatoes in sacks of various weights. The table shows the price per weight.

Weight	5 lb	10 lb	15 lb	20 lb	30 lb	50 lb
Price	\$4	\$7.50	\$9	\$12	\$15	\$25

a. Are these two quantities in proportion?

Explain how you can tell that.

b. If so, write an equation relating the two and state the constant of proportionality.

Geometry

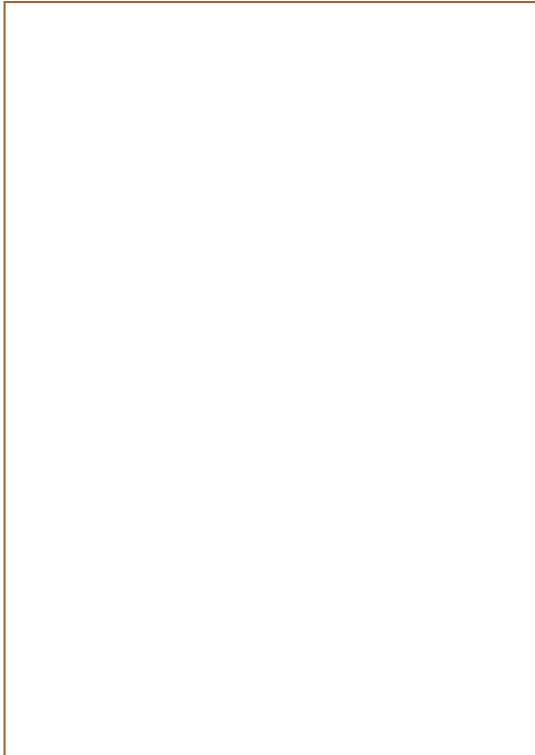
You may use a basic calculator for all the problems in this section.

34. The rectangle you see below is Jayden's room, drawn here at a scale of 1:45.

a. Calculate the area of Jayden's room in reality, in square meters.

Hint: measure the dimensions of the rectangle in centimeters.

b. Reproduce the drawing at a scale of 1:60.



Scale 1:45

35. A room measures $4\frac{1}{4}$ in. by $3\frac{1}{2}$ in. in a house plan with a scale of 1 in : 3 ft. Calculate the actual dimensions of the room.

36. Calculate the area of a circle with a diameter of 16 cm.

37. Calculate the circumference of a circle with a radius of 9 inches.

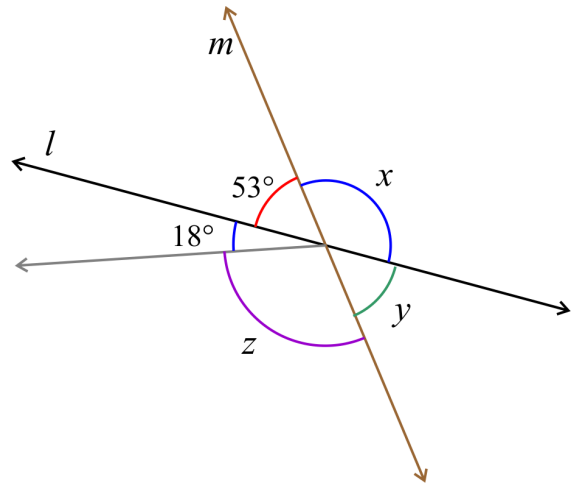
38. Draw a triangle with sides 8 cm, 11 cm, and 14.5 cm using a compass and a ruler.

39. A triangle has angles that measure 36° , 90° , and 54° , and a side of 8 cm.

a. Does the information given determine a unique triangle?

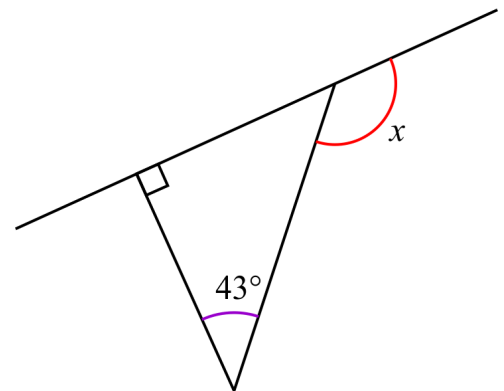
b. If so, draw the triangle. If not, draw several different triangles that fit the description.

40. a. Write an equation for the measure of angle x , and solve it.

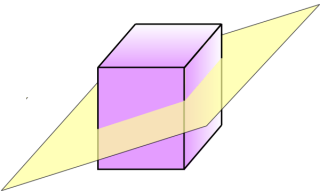
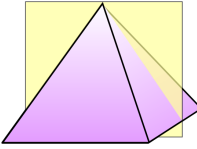
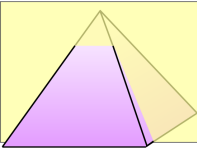


b. Write an equation for the measure of angle z , and solve it.

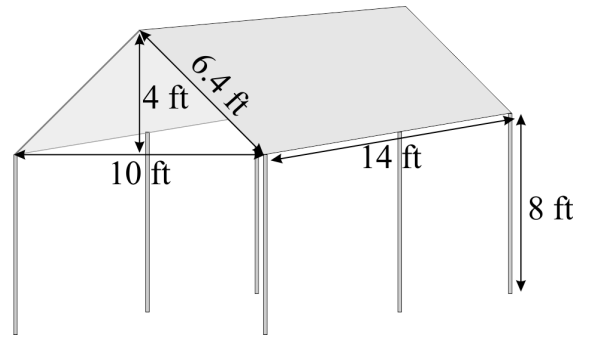
41. Calculate the measure of the unknown angle x .



42. Describe the cross sections formed by the intersection of the plane and the solid.

<p>a. </p> <p>The cross section is _____.</p>	<p>b. </p> <p>The cross section is _____.</p>	<p>c. </p> <p>The cross section is _____.</p>
--	--	--

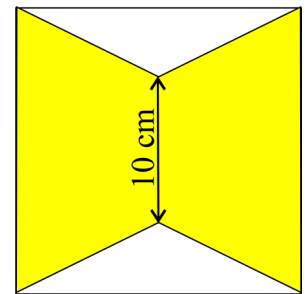
43. a. Calculate the volume enclosed by the roof (the top part).



b. Calculate the total volume enclosed by the canopy.

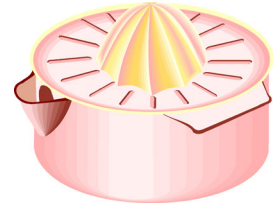
44. Two identical trapezoids are placed inside a 15 cm by 15 cm square.

a. Calculate their area.



b. What percentage of the square do the trapezoids cover?

45. **a.** *Find the volume of the cylindrical part of the juicer, if its bottom diameter is 12 cm and its height is 4.5 cm.



- b.** *Convert the volume to milliliters and to liters, considering that $1 \text{ ml} = 1 \text{ cm}^3$.

46. **a.** *How many cubic inches are in one cubic foot?

- b.** *The edges of a cube measure $3 \frac{1}{4}$ ft. Calculate the volume of the cube in cubic inches.

The Pythagorean Theorem

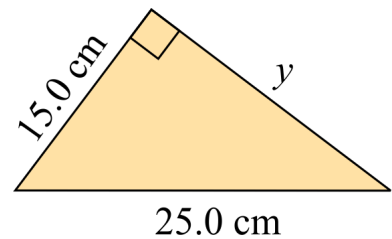
You may use a basic calculator for all the problems in this section.

47. *a. What is the area of a square, if its side measures $\sqrt{5}$ m?

*b. How long is the side of a square with an area of 45 cm^2 ?

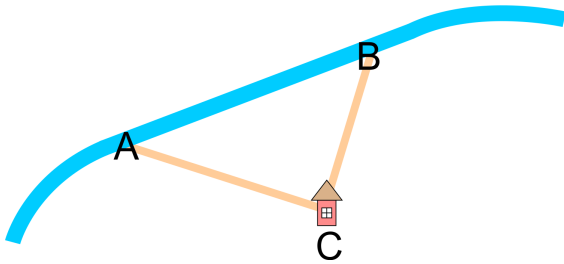
48. *Determine whether the lengths 57 cm, 95 cm, and 76 cm form a right triangle. Show your work.

49. *Solve for the unknown side of the triangle to the nearest tenth of a centimeter.



50. *You and your friends are at a river at point A. You suddenly remember you need something from home, which is at point C. So you decide to go home (distance AC) and then walk along the road (distance CB) to meet your friends, who will walk along the riverside from A to B.

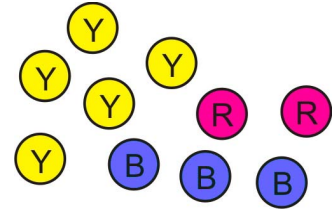
If ABC is a right triangle, $AC = 120$ m, and $CB = 110$ m, how much longer distance (in meters) will you walk than your friends?



Probability

You may use a basic calculator for all the problems in this section.

51. You randomly pick one marble from these marbles.
Find the probabilities:



a. $P(\text{not red})$

b. $P(\text{blue or red})$

c. $P(\text{green})$

52. A cafeteria offers a main dish with chicken or beef. The customer then chooses a portion of rice, pasta, or potatoes, and a side dish of green salad, green beans, steamed cabbage, or coleslaw.

a. Draw a tree diagram or make a list of all the possible meal combinations.

A customer chooses the parts of the meal randomly. Find the probabilities:

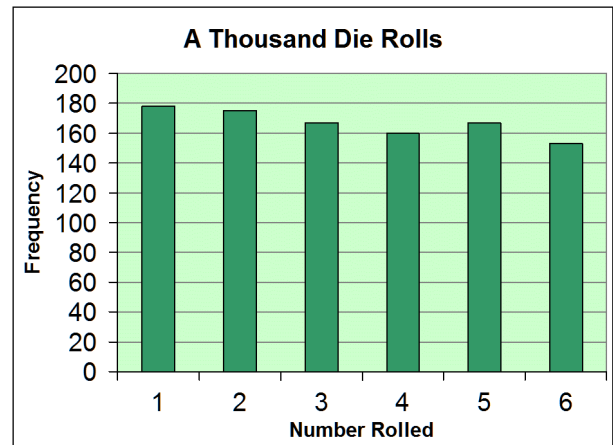
b. $P(\text{beef, rice, coleslaw})$

c. $P(\text{no coleslaw nor steamed cabbage})$

d. $P(\text{chicken, green salad})$

53. John and Jim rolled a die 1,000 times. The bar graph shows their results. Based on the results, which of the following conclusions, if any, are valid?

- (a) This die is unfair.
- (b) On this die, you will always get more 1s than 6s.
- (c) Next time you roll, you will not get a 4.



54. Let's assume that when a child is born, the probability that it is a boy is $\frac{1}{2}$ and also $\frac{1}{2}$ for a girl. One year, there were 10 births in a small community, and nine of them were girls. Explain how you could use coin tosses to simulate the situation, and to find the (approximate) probability that out of 10 births, exactly nine are girls. (You do not have to actually perform the simulation—just explain how it would be done.)

Statistics

You may use a basic calculator for all the problems in this section.

55. To determine how many students in her college use a particular Internet search engine, Cindy chose some students randomly from her class, and asked them whether they used that search engine.

Is Cindy's sampling method biased or unbiased?

Explain why.

56. 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

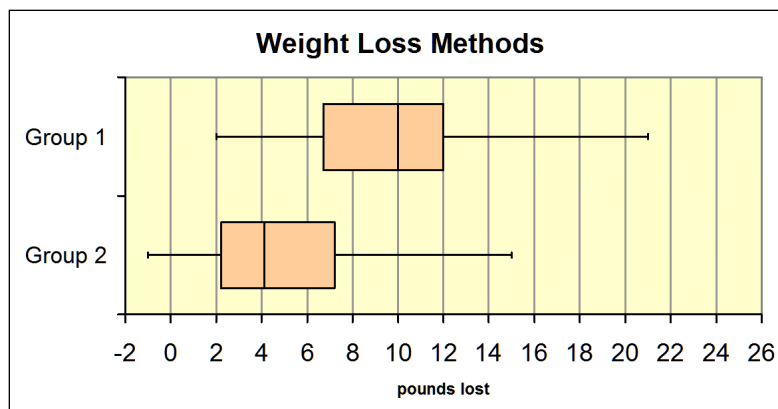
- Based on the polls, predict the winner of the election.
- Assuming there will be 8,500 voters in the actual election, estimate to the nearest hundred votes how many votes Thomas will get.
- Gauge how much off your estimate might be.

57. Gabriel randomly surveyed some households in a small community to determine how many of them support building a new highway near the community. Here are the results:

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

If the community contains a total of 2,120 households, predict how many of them would support building the highway.

58. Researchers compared two different methods for losing weight by assigning 50 overweight people to use each method. The side-by-side boxplots show how many pounds people in each Group lost.



a. Just looking at the two distributions, which Group, if any, appears to have lost more weight?

b. Which Group, if any, appears to have a greater variability in the amount of weight lost?

c. In Group 2, there is one person whose weight loss was -1 pound. What does that mean?

d. Is one of the weight loss methods significantly better than the other?

If so, which one?

Justify your reasoning.