

Answer Key For The California Mathematics Standards Grade 6

Introduction: Summary of Goals

GRADE SIX

By the end of grade six, students have mastered the four arithmetic operations with whole numbers, positive fractions, positive decimals, and positive and negative integers; they accurately compute and solve problems. They apply their knowledge to statistics and probability. Students understand the concepts of mean, median, and mode of data sets and how to calculate the range. They analyze data and sampling processes for possible bias and misleading conclusions they use addition and multiplication of fractions routinely to calculate the probabilities for compound events. Students conceptually understand and work with ratios and proportions; they compute percentages (e.g., tax, tips, and interest). Students know about π and the formulas for the circumference and area of a circle. They use letters for numbers in formulas involving geometric shapes and in ratios to represent an unknown part of an expression. They solve one-step linear equations.

Answer Key For The California Mathematics Standards Grade 6

Number Sense 1.0: Students compare and order positive and negative fractions, decimals, and mixed numbers. Students solve problems involving fractions, ratios, proportions, and percentages.

NS 1.1: Students compare and order positive and negative fractions, decimals, and mixed numbers and place them on a number line.

- a. After each number, write the letter that corresponds to the place it would be on the number line:

$$\frac{-13}{10} \quad \mathbf{B}$$

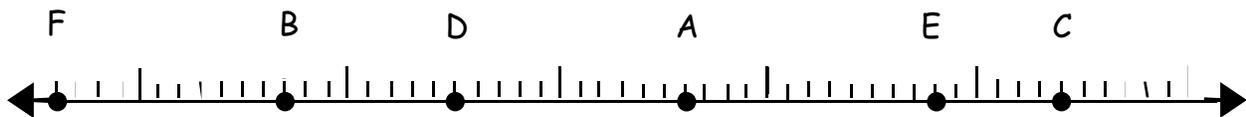
$$1.8 \quad \mathbf{E}$$

$$-0.5 \quad \mathbf{D}$$

$$0.6 \quad \mathbf{A}$$

$$2.40 \quad \mathbf{C}$$

$$-2.4 \quad \mathbf{F}$$



- b. List these values from lowest to highest: 2.3, -1.3, 1.8, -0.2

-1.3, -0.2, 1.8, 2.3

Answer Key For The California Mathematics Standards Grade 6

Number Sense 1.0: Students compare and order positive and negative fractions, decimals, and mixed numbers. Students solve problems involving fractions, ratios, proportions, and percentages.

NS 1.2: Students interpret and use ratios in different contexts (e.g., batting averages, miles per hour) to show the relative sizes of two quantities, using appropriate notations (a/b , a to b , $a:b$).

a. Write the following:

1. The ratio of tricycles to tricycle wheels:

1 to 3, 1:3, or $\frac{1}{3}$

2. The ratio of hands to fingers: 2:10, 1:5, or $\frac{1}{5}$

b. If there are 6 tricycle wheels, how many tricycles are there?

2

$$\frac{1}{3} = \frac{n}{6} \quad 3n = 6 \quad n = 2$$

c. If there are 45 fingers, how many hands are there?

9

$$\frac{1}{5} = \frac{n}{45} \quad 5n = 45 \quad n = 9$$

d. If the ratio of boys to girls on the team is 2:3 and there are 12 girls, how many boys are there?

8

$$\frac{2}{3} = \frac{n}{12} \quad 3n = 24 \quad n = 8$$

Answer Key For The California Mathematics Standards Grade 6

Number Sense 1.0: Students compare and order positive and negative fractions, decimals, and mixed numbers. Students solve problems involving fractions, ratios, proportions, and percentages.

NS 1.3: Students use proportions to solve problems (e.g., determine the value of N if $4/7 = N/21$, find the length of a side of a polygon similar to a known polygon). Use cross-multiplication as a method for solving such problems, understanding it as the multiplication of both sides of an equation by a multiplicative inverse.

a. Solve for n : $\frac{8}{12} = \frac{n}{3}$ $n = 2$

$$12n = 8 \times 3$$

$$12n = 24$$

$$n = 2$$

b. Solve for n : $\frac{5}{6} = \frac{n}{12}$ $n = 10$

$$6n = 5 \times 12$$

$$6n = 60$$

$$n = 10$$

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Number Sense 1.0: Students compare and order positive and negative fractions, decimals, and mixed numbers. Students solve problems involving fractions, ratios, proportions, and percentages.

NS 1.3: Students use proportions to solve problems (e.g., determine the value of N if $4/7 = N/21$, find the length of a side of a polygon similar to a known polygon). Use cross-multiplication as a method for solving such problems, understanding it as the multiplication of both sides of an equation by a multiplicative inverse.

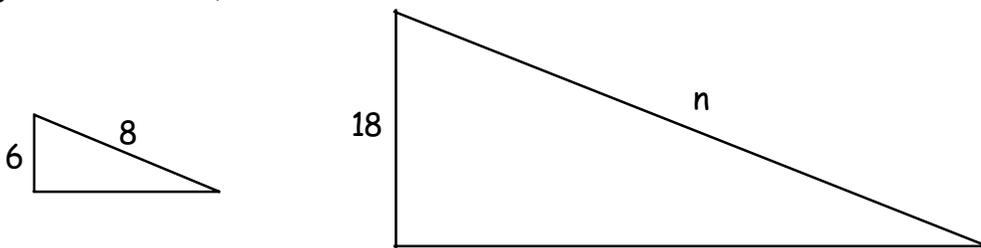
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- c. Make a proportion and solve for the unknown.

A car went 70 miles in 4 hours. If it continues going the same speed, how long will it take to go 175 miles? **10 hours**

$$\begin{aligned}\frac{70}{4} &= \frac{175}{n} & 70n &= 4 \times 175 \\ 70n &= 700 & n &= 10\end{aligned}$$

- d. Here are two triangles whose corresponding sides are in proportion (i.e., the triangles are similar).



Find n , the length of the longest side in the larger triangle. $n =$ **24**

$$\begin{aligned}\frac{6}{18} &= \frac{8}{n} & 6n &= 18 \times 8 \\ 6n &= 144 & n &= 24\end{aligned}$$

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Number Sense 1.0: Students compare and order positive and negative fractions, decimals, and mixed numbers. Students solve problems involving fractions, ratios, proportions, and percentages.

NS 1.3: Students use proportions to solve problems (e.g., determine the value of N if $4/7 = N/21$, find the length of a side of a polygon similar to a known polygon). Use cross-multiplication as a method for solving such problems, understanding it as the multiplication of both sides of an equation by a multiplicative inverse.

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- e. Joe can type 11 words in 8 seconds. At this rate, how many words can he type in two minutes? **165**

$$\frac{11}{8} = \frac{n}{2 \times 60} \quad \frac{11}{8} = \frac{n}{120} \quad \begin{array}{l} 8n = 11 \times 120 = 1,320 \\ 8n = 1,320 \\ n = 165 \end{array}$$

- f. We made a bowl of punch using lemonade and soda pop. The ratio of lemonade to soda pop is 2:3. If there are 25 gallons of punch, how much lemonade is needed? **10** gallons.

$$\frac{2}{2+3} = \frac{n}{25} \quad \frac{2}{5} = \frac{n}{25} \quad \begin{array}{l} 5n = 2 \times 25 = 50 \\ 5n = 50 \\ n = 10 \end{array}$$

Answer Key For The California Mathematics Standards

Grade 6

Number Sense 1.0: Students compare and order positive and negative fractions, decimals, and mixed numbers. Students solve problems involving fractions, ratios, proportions, and percentages.

NS 1.4: Students calculate given percentages of quantities and solve problems involving discounts at sales, interest earned, and tips.

- a. A coat usually costs \$45. During a sale, its price was reduced 20%.
What is the price during the sale? **\$36**

$$\begin{aligned} 20\% \text{ of } 45 &= .20 \times 45 \\ &= 9 \end{aligned}$$

Therefore, \$45 reduced by
20% is \$45 reduced by \$9.
 $\$45 - \$9 = \$36$

- b. A car cost \$12,000. During a sale, it will cost only \$10,920
What percent was the price reduced?

$$12,000 - 10,920 = 1,080$$

$$\frac{1080}{12000} = \frac{108}{1200} = \frac{36}{400} = \frac{9}{100} = 9\%$$

- c. A meal cost \$15. We gave the waiter \$18 and told him that the
difference was his tip. What percent of the cost of the meal was the
tip we gave?

$$18 - 15 = 3$$

$$\frac{3}{15} = \frac{n}{100}$$

$$15n = 300$$

$$n = 20$$

Answer Key For The California Mathematics Standards Grade 6

Number Sense 2.0: Students calculate and solve problems involving addition, subtraction, multiplication, and division.

NS 2.1: Students solve problems involving addition, subtraction, multiplication, and division of positive fractions, and explain why a particular operation was used for a given situation.

Calculate and reduce to lowest terms:

a. $3\frac{5}{12} + 2\frac{1}{2} + 3\frac{4}{15} = 9\frac{11}{60}$

$$3\frac{5}{12} + 2\frac{1}{2} + 3\frac{4}{15} = 3\frac{25}{60} + 2\frac{30}{60} + 3\frac{16}{60} = 8\frac{71}{60} = 8 + 1\frac{11}{60} = 9\frac{11}{60}$$

b. $124 \div 3\frac{1}{2} = 35\frac{3}{7}$

$$124 \div 3\frac{1}{2} = 124 \div \frac{7}{2} = 124 \times \frac{2}{7} = \frac{248}{7} = 35\frac{3}{7}$$

c. $9\frac{2}{3} - 4\frac{1}{2} = 5\frac{1}{6}$

$$9\frac{4}{6} - 4\frac{3}{6} = 5\frac{1}{6}$$

Answer Key For The California Mathematics Standards Grade 6

Number Sense 2.0: Students calculate and solve problems involving addition, subtraction, multiplication, and division.

NS 2.2: Students explain the meaning of multiplication and division of positive fractions and perform the calculation (e.g. $\frac{5}{8} \div \frac{15}{16} = \frac{5}{8} \times \frac{16}{15} = \frac{2}{3}$).

a. Half of the children in our school watch television every night. Three-fourths of those children watch for more than an hour. What fraction of the total children watch for more than an hour a night?

$$\frac{3}{8}$$

$$\frac{3}{4} \times \frac{1}{2} = \frac{3}{8}$$

b. A fraction $\frac{m}{n}$ satisfies the equation $\frac{m}{n} \times \frac{3}{5} = \frac{138}{415}$

$$\text{Find } \frac{138}{415} \div \frac{m}{n} = \frac{3}{5}$$

It is not necessary to solve for $\frac{m}{n}$.

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Number Sense 2.0: Students calculate and solve problems involving addition, subtraction, multiplication, and division.

NS 2.3: Students solve addition, subtraction, multiplication, and division problems, including those arising in concrete situations, that use positive and negative integers and combinations of these operations.

Find integer solutions:

a. $-16(-8 + 9) =$ **-16**

$$-16 \times 1 = -16$$

b. $(-8)(-4)(12) =$ **384**

$$32 \cdot 12 = 384$$

c. $-20 \div 5 =$ **-4**

d. $-12 + (3 + 6) =$ **-3**

$$-12 + 9 = -3$$

- e. In Alaska the temperature was -15°F in the morning; by noon the temperature had increased by 20°F ; by 9:00 p.m. the temperature had dropped 30°F . What temperature was it at 9:00 p.m.? **-25°F**

$$-15 + 20 - 30 = 5 - 30 = -25$$

Answer Key For The California Mathematics Standards

Grade 6

Number Sense 2.0: Students calculate and solve problems involving addition, subtraction, multiplication, and division.

NS 2.4: Students determine the least common multiple and the greatest common divisor of whole numbers; use them to solve problems with fractions (e.g., to find a common denominator to add two fractions or to find the reduced form for a fraction).

a. Reduce to lowest common terms:

$$\frac{96}{128} = \frac{3}{4}$$

$$\begin{aligned} \text{GCF}(12,15) &= 3 \\ 12 \times 15 &= 180 \\ 180 \div 3 &= 60 \end{aligned}$$

b. What is the least common multiple of 12 and 15?

60

$$\begin{aligned} \text{GCF}(12,15) &= 3 \\ 12 \div 3 &= 4 \\ 15 \div 3 &= 5 \\ 3 \times 4 \times 5 &= 60 \end{aligned}$$

Answer Key For The California Mathematics Standards

Grade 6

Algebra and Functions 1.0: Students write verbal expressions and sentences as algebraic expressions and equations; they evaluate algebraic expressions, solve simple linear equations, and graph and interpret their results.

AF 1.1: Students write and solve one-step linear equations in one variable.

$y + 4 = 10$. What is y ?

$$\begin{aligned}y + 4 &= 10 \\y &= 10 - 4 \\y &= 6\end{aligned}$$

Algebra and Functions 1.0: Students write verbal expressions and sentences as algebraic expressions and equations; they evaluate algebraic expressions, solve simple linear equations, and graph and interpret their results.

AF 1.2: Students write and evaluate an algebraic expression for a given situation, using up to three variables.

a. Write the following as algebraic expressions

(let n be some number):

1. a number increased by 33:

$$n + 33$$

2. The product of a number and (-7) :

$$-7n$$

3. 8 decreased by some number:

$$8 - n$$

4. Some number squared divided by 7:

$$n^2 \div 7 \text{ or } \frac{n^2}{7}$$

Answer Key For The California Mathematics Standards

Grade 6

Algebra and Functions 1.0: Students write verbal expressions and sentences as algebraic expressions and equations; they evaluate algebraic expressions, solve simple linear equations, and graph and interpret their results.

AF 1.2: Students write and evaluate an algebraic expression for a given situation, using up to three variables.

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b. If $n = 2$, evaluate:

$$(-5)n + n^2 = \mathbf{-6}$$

$$\text{When } N = 2, (-5)(2) + 2^2 = -10 + 4 = \mathbf{-6}$$

c. $x = 3$ $y = 4$ $z = 5$

Evaluate: $2x + 3y + z^2 = \mathbf{43}$

Answer Key For The California Mathematics Standards

Grade 6

Algebra and Functions 1.0: Students write verbal expressions and sentences as algebraic expressions and equations; they evaluate algebraic expressions, solve simple linear equations, and graph and interpret their results.

AF 1.3: Students apply algebraic order of operations and the commutative, associative, and distributive properties to evaluate expressions, and justify each step in the process.

a. Evaluate the following expressions, showing each step.

1. $5(3 + 7) - 2$

$$\begin{aligned} &= 5 \cdot 3 + 5 \cdot 7 - 2 \\ &= 15 + 35 - 2 \\ &= 50 - 2 \\ &= 48 \end{aligned}$$

2. $5 + 3 \times 7$

$$\begin{aligned} &= 5 + 21 \\ &= 26 \end{aligned}$$

b. Justify each of the following equations using one of: the commutative property of addition, the commutative property of multiplication, the associative property of addition, the associative property of multiplication or the distributive property.

1. $3(4 \times 5) = (3 \times 4) 5$
2. $3 \times 7 = 7 \times 3$
3. $5 + (2 + 1) = (5 + 2) + 1$
4. $5(6 + 4) = 5 \times 6 + 5 \times 4$
5. $3 + 7 = 7 + 3$

Associative Property of Multiplication
Commutative Property of Multiplication
Associative Property of Addition
Distributive Property
Commutative Property of Addition

Answer Key For The California Mathematics Standards

Grade 6

Algebra and Functions 1.0: Students write verbal expressions and sentences as algebraic expressions and equations; they evaluate algebraic expressions, solve simple linear equations, and graph and interpret their results.

AF 1.4: Students solve problems manually by using the correct order of operations or by using a scientific calculator.

Evaluate the following expressions, showing each step.

a.
$$\frac{4(12 - 3^2)}{6} = \frac{4(12 - 9)}{6} = \frac{4(3)}{6} = \frac{12}{6} = 2$$

b.
$$2(4 + 8) \times 6(8 - 3) = 2(12) \times 6(5) = 24 \times 30 = 720$$

Algebra and Functions 2.0: Students analyze and use tables, graphs, and rules to solve problems involving rates and proportions.

AF 2.1: Students convert one unit of measurement to another (e.g., from feet to miles, from centimeters to inches).

a. How many hours are there in 7 days?

$$24 \times 7 = 168 \text{ hours}$$

b. How many centimeters are there in 5 inches? [1 inch = 2.54 cm]

$$2.54 \times 5 = 12.70 = 12.7 \text{ So, 5 inches} = 12.7\text{cm}$$

Answer Key For The California Mathematics Standards Grade 6

Algebra and Functions 2.0: Students analyze and use tables, graphs, and rules to solve problems involving rates and proportions.

AF 2.2: Students demonstrate and understanding that *rate* is a measure of one quantity per unit value of another quantity.

AF 2.3: Students solve problems involving rates, average speed, distance, and time.

- a. Marcus took a train from San Francisco to San Jose, which is a distance of 54 miles. The train took 45 minutes for the trip. What was the average speed of the train expressed in miles per hour?

$$\frac{54 \text{ miles}}{45 \text{ min}} \times \frac{n \text{ miles}}{60 \text{ min}}$$

$$45n = 54 \times 60$$

$$45n = 3,240$$

$$n = 3,240 \div 45 = 72 \text{ miles}$$

The average speed was 72 miles per hour

- b. At 8:00 a.m. the temperature was 40°F. At 3:00 p.m. the temperature was 75°F. What was the average temperature change per hour?

$$75^\circ - 40^\circ = 35^\circ$$

$$15:00 - 8:00 = 7 \text{ hours}$$

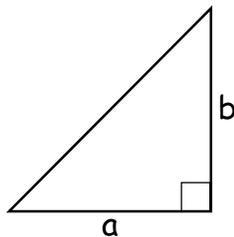
$$\frac{35^\circ}{7} = 5 \text{ degrees per hour}$$

Answer Key For The California Mathematics Standards Grade 6

Algebra and Functions 3.0: Students investigate geometric patterns and describe them algebraically.

AF 3.1: Students use variables in expressions describing geometric quantities (e.g., $P = 2w + 2l$, $A = \frac{1}{2}bh$, $C = \pi d$ — the formulas for the perimeter of a rectangle, the area of a triangle, and the circumference of a circle, respectively).

What is the area of the triangle below; express the answer algebraically:



$$\text{Area} = \frac{1}{2}ab \quad \text{or} \quad \frac{ab}{2}$$

Algebra and Functions 3.0: Students investigate geometric patterns and describe them algebraically.

AF 3.2: Students express in symbolic form simple relationships arising from geometry.

A rectangle has width w . Its length is one more than 3 times its width.

Find the perimeter of the rectangle.

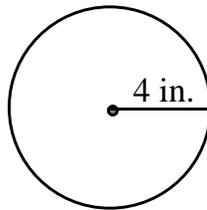
(Your answer will be expressed in terms of w .)

Let the width be w . Then the length is $3w + 1$. The perimeter P is given by $P = 2(w + 3w + 1) = 2(4w + 1) = 8w + 2$

Answer Key For The California Mathematics Standards Grade 6

Measurement and Geometry 1.0: Students deepen their understanding of the measurement of plane and solid shapes and use this understanding to solve problems.

MG 1.1: Students understand the concept of a constant such as π ; know the formulas for the circumference and area of a circle.



Give exact answers to these questions.

- a. What is the circumference of this circle? 8π in

$$\begin{aligned}C &= d\pi \\ &= (4 \times 2)\pi \\ &= 8\pi\end{aligned}$$

- b. What is the area of this circle? 16π in²

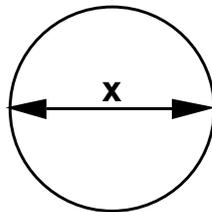
$$\begin{aligned}A &= \pi r^2 \\ &= \pi \cdot 4^2 \\ &= 16\pi\end{aligned}$$

Answer Key For The California Mathematics Standards Grade 6

Measurement and Geometry 1.0: Students deepen their understanding of the measurement of plane and solid shapes and use this understanding to solve problems.

MG 1.2: Students know common estimates of π (3.14 ; $\frac{22}{7}$) and use these values to estimate and calculate the circumference and the area of circles; compare with actual measurements.

How many segments "x" will fit on the circumference of this circle?
Express your answer to the nearest hundredth. **3.14x**



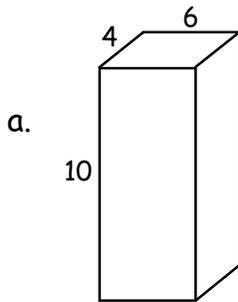
$$\begin{aligned}\pi &= 3.14 \\ C &= d\pi \\ &= x \cdot 3.14 \\ &= 3.14x\end{aligned}$$

Answer Key For The California Mathematics Standards Grade 6

Measurement and Geometry: Students deepen their understanding of the measurement of plane and solid shapes and use this understanding to solve problems.

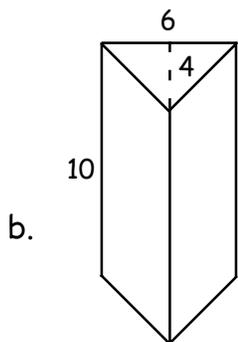
MG 1.3: Students know and use the formulas for the volume of triangular prisms and cylinders (area of base \times height); compare these formulas and explain the similarity between them and the formula for the volume of a rectangular solid.

Find the volumes (dimensions are cm):



$$v = l \times w \times h$$

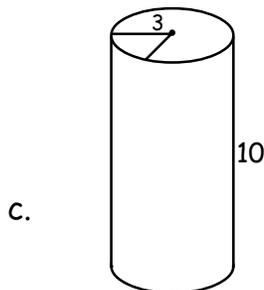
$$v = 6 \times 4 \times 10 = 240 \text{ cm}^3$$



$$v = \text{area of base} \times \text{height}$$

$$v = \frac{1}{2}(4 \times 6)10$$

$$v = 120 \text{ cm}^3$$



$$v = \pi r^2 \cdot h$$

$$= \pi \cdot 3^2 \cdot 10$$

$$= 90\pi$$

$$= 90 \text{ cm}^3$$

Answer Key For The California Mathematics Standards Grade 6

Measurement and Geometry 2.0: Students identify and describe the properties of two-dimensional figures.

MG 2.1: Students identify angles as vertical, adjacent, complementary, or supplementary and provide descriptions of these terms.

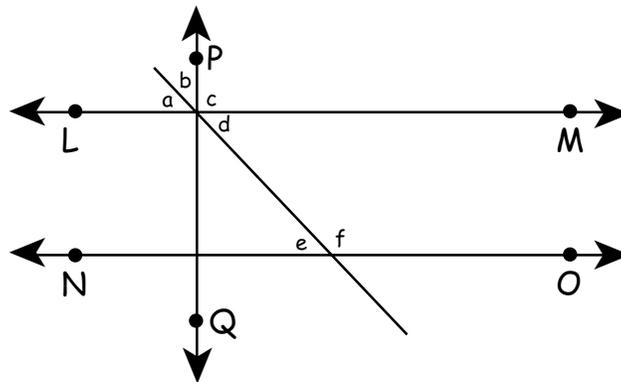
Line LM is parallel to Line NO. Line PQ is perpendicular to line LM and line NO.

- Identify the complimentary angles
- Identify ONE pair of supplementary angles
- Identify a pair of vertical angles

La & Lb, Lb & Ld, Lb & Le

Le & Lf or Ld & Lf

La & Ld

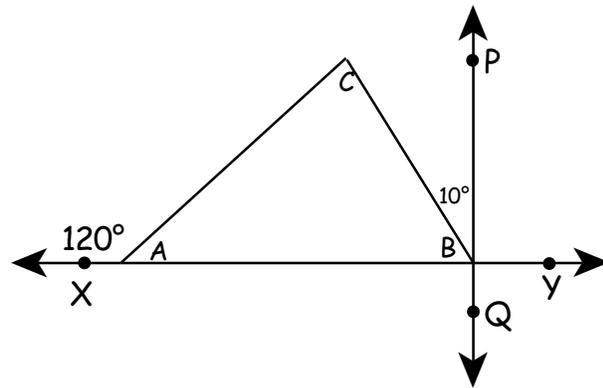


Answer Key For The California Mathematics Standards Grade 6

Measurement and Geometry 2.0: Students identify and describe the properties of two-dimensional figures.

MG 2.2: Students use the properties of complementary and supplementary angles and the sum of the angles of a triangle to solve problems involving an unknown angle.

Line PQ is perpendicular to line XY.



a. How many degrees in angle A?

$$180 - 120 = 60^\circ$$

b. How many degrees in angle B?

$$90 - 10 = 80^\circ$$

c. How many degrees in angle C?

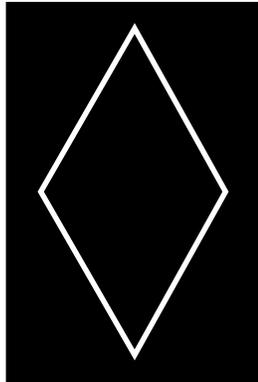
$$180 - 60 - 80 = 40^\circ$$

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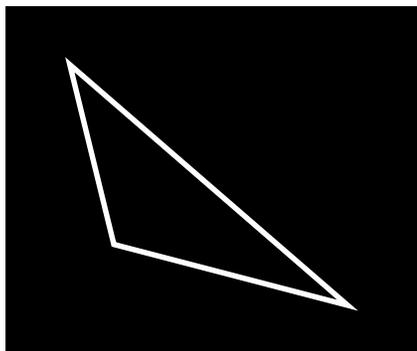
Measurement and Geometry 2.0: Students identify and describe the properties of two-dimensional figures.

MG 2.3: Students draw quadrilaterals and triangles from given information about them (e.g., a quadrilateral having equal sides but no right angles, a right isosceles triangle).

- a. Draw a quadrilateral that has equal sides and no right angles:



- b. Draw an obtuse, scalene triangle:



Answer Key For The California Mathematics Standards Grade 6

Statistics, Data Analysis, and Probability 1.0: Students compute and analyze statistical measurements for data sets.

S 1.1: Students compute the range, mean, median, and mode of data sets.

Below are the test scores of nine students on the science test:

50 50 50 50 51 89 90 90 90

a. What is the mean score?

$67\frac{7}{9}$

$$\begin{aligned}\text{Mean score} &= \frac{50 + 50 + 50 + 50 + 51 + 89 + 90 + 90 + 90}{9} \\ &= \frac{4 \times 50 + 51 + 89 + 3 \times 90}{9} \\ &= \frac{200 + 140 + 270}{9} \\ &= \frac{610}{9} \\ &= 67\frac{7}{9}\end{aligned}$$

b. What is the median score?

51

c. What is the mode?

50

d. What is the range?

40

$$90 - 50 = 40$$

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Statistics, Data Analysis, and Probability 1.0: Students compute and analyze statistical measurements for data sets.

S 1.2: Students understand how additional data added to data sets may affect these computations of measures of central tendency.

S 1.3: Students understand how the inclusion or exclusion of outliers affects measures of central tendency.

If a tenth student in the class in the previous question scored only a 10 on the test, would that increase, decrease, or leave unchanged the mean score?

Decrease

Answer Key For The California Mathematics Standards Grade 6

Statistics, Data Analysis, and Probability 1.0: Students compute and analyze statistical measurements for data sets.

S 1.4: Students know why a specific measure of central tendency (mean, median, mode) provides the most useful information in a given context.

The annual incomes for employees at Unfair, Inc. are \$20,000, \$30,000, \$32,000 and \$2,525,627. Which of the median or mean income would *best* characterize the income of a typical employee at Unfair, Inc.?

median

Mean = \$651,906.75

Median = \$31,000

The median in this case better represents a typical annual income.

Statistics, Data Analysis, and Probability 2.0: Students use data samples of a population and describe the characteristics and limitations of the samples.

S 2.1: Students compare different samples of a population with the data from the entire population and identify a situation in which it makes sense to use a sample.

I have seven friends who are on the football team with me. I'll ask them what kind of music they like. This information will help me find out what kind of music the students in our school like best. What is wrong with the last statement?

The sample is not randomly chosen, it is too small for a typical school, and it is not likely to be representative of the student body.

Answer Key For The California Mathematics Standards Grade 6

Statistics, Data Analysis, and Probability 2.0: Students use data samples of a population and describe the characteristics and limitations of the samples.

S 2.2: Students identify different ways of selecting a sample (e.g., convenience sampling, responses to a survey, random sampling) and which method makes a sample more representative for a population.

You don't have time to ask all the students in your school about music.

Which method of sampling would work best to help you?

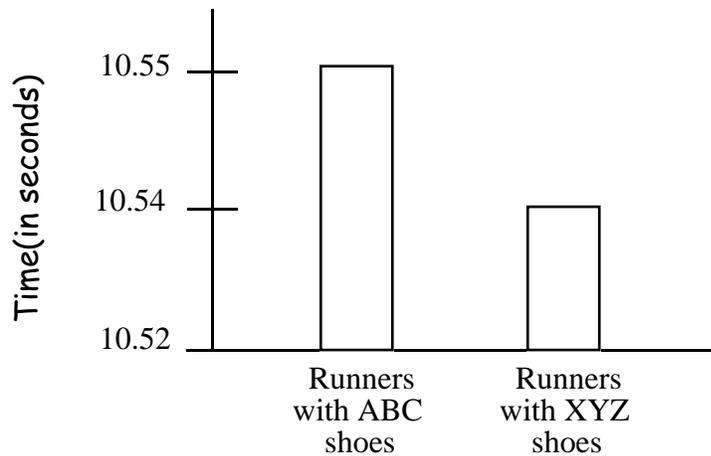
- A) Ask your friends
- B) Ask the best dressed students
- C) Randomly select names from a list of students**

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Statistics, Data Analysis, and Probability 2.0: Students use data samples of a population and describe the characteristics and limitations of the samples.

S 2.3: Students analyze data displays and explain why the way in which the question was asked might have influenced the results obtained and why the way in which the results were displayed might have influenced the conclusions reached.

Time to run 100 meters:



Explain how a conclusion from these data might be influenced by the way the data are presented.

The scale on the (vertical) time axis makes it appear at first glance that runners with ABC shoes took much longer to run 100 meters than runners with XYZ shoes. However, their times differ by only .01 second.

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Statistics, Data Analysis, and Probability 2.0: Students use data samples of a population and describe the characteristics and limitations of the samples.

S 2.4: Students identify data that represent sampling errors and explain why the sample (and the display) might be biased.

A group of people were given a survey about the importance of health care for the elderly. The table below lists the percentages of people surveyed in different age groups. For example, 18% of the people surveyed were between 14 and 23 years of age.

Percent:	18%	30%	30%	18%	2%	2%
Ages:	14-23	24-33	34-43	44-53	54-63	64-73

Why might the sample be biased?

The percentage of people over the age of 53 in the sample is only 4%. The sample does not represent adequately the opinions of elderly people.

Statistics, Data Analysis, and Probability 2.0: Students use data samples of a population and describe the characteristics and limitations of the samples.

S 2.5: Students identify claims based on statistical data and, in simple cases, evaluate the validity of the claims.

Refer to the data from the previous question. A survey using that sample found that health care for older people is not very important to the American people. How valid is that claim? Explain your answer.

It's not a valid claim. Only 4% of those people sampled were aged over 53. These people are likely to think that health care for older people is very important.

Answer Key For The California Mathematics Standards Grade 6

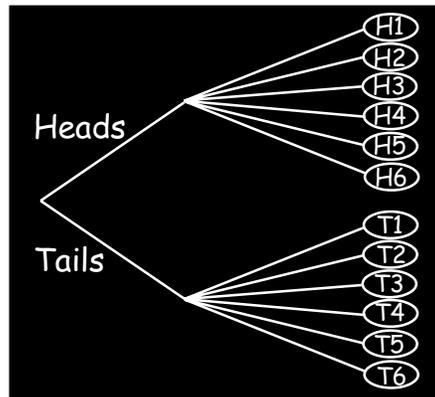
Statistics, Data Analysis, and Probability 3.0: Students determine theoretical and experimental probabilities and use these to make predictions about events.

S 3.1: Students represent all possible outcomes for compound events in an organized way (e.g., tables, grids, tree diagrams) and express the theoretical probability of each outcome.

- a. Represent all possible outcomes of flipping one coin and rolling one six-sided die. Label your representation clearly.

Coin	Coin
H	1
H	2
H	3
H	4
H	5
H	6

Coin	Coin
T	1
T	2
T	3
T	4
T	5
T	6



- b. What is the probability of each outcome in item a? Express your answer as both a fraction and a decimal rounded to the nearest thousandth.

Fraction $\frac{1}{12}$

Decimal 0.083

The probability of either outcome of the coin toss is $\frac{1}{2}$, and the probability of each particular outcome from rolling a die is $\frac{1}{6}$, since these experiments are independent, the probability of any particular outcome from part a is $\frac{1}{2} \times \frac{1}{6} = \frac{1}{12}$

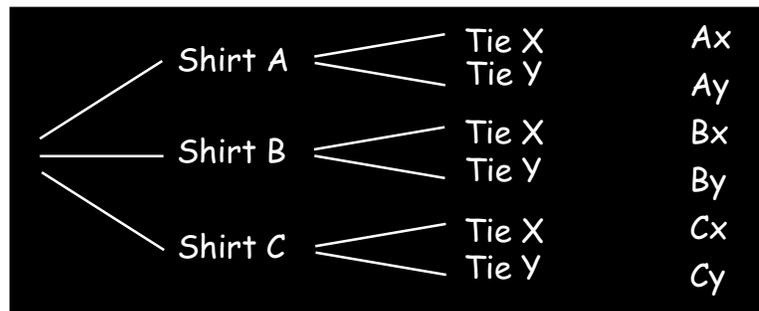
Answer Key For The California Mathematics Standards Grade 6

Statistics, Data Analysis, and Probability 3.0: Students determine theoretical and experimental probabilities and use these to make predictions about events.

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[CONTINUED]

c. A man has 3 shirts and 2 ties. Make a tree diagram to show all possible ways of choosing a shirt and tie.



Answer Key For The California Mathematics Standards Grade 6

Statistics, Data Analysis, and Probability 3.0: Students determine theoretical and experimental probabilities and use these to make predictions about events.

S 3.1: Students represent all possible outcomes for compound events in an organized way (e.g., tables, grids, tree diagrams) and express the theoretical probability of each outcome.

[CONTINUED]

d. Assume the man in item c has no preference for specific shirt-and-tie combinations, and all his shirts and ties are available. What is the probability of each possibility in item c?

Express your answer as a fraction.

$$\frac{1}{6}$$

e. Make an organized list of all possible outcomes for flipping a penny, a dime, and quarter.

Penny	Dime	Quarter
H	H	H
H	H	T
H	T	H
H	T	T
T	H	H
T	H	T
T	T	H
T	T	T

Answer Key For The California Mathematics Standards

Grade 6

Statistics, Data Analysis, and Probability 3.0: Students determine theoretical and experimental probabilities and use these to make predictions about events.

S 3.2: Students use data to estimate the probability of future events (e.g., batting averages or number of accidents per mile driven).

A basketball player took 25 shots at the basket. He made 12 of the shots.

If he keeps shooting at the same rate, how many shots will he make if he takes 300 shots? **144**

$$\frac{12}{25} = \frac{n}{300}$$

$$25n = 300 \times 12$$

$$25n = 3,600$$

$$n = 144$$

Answer Key For The California Mathematics Standards

Grade 6

Statistics, Data Analysis, and Probability 3.0: Students determine theoretical and experimental probabilities and use these to make predictions about events.

S 3.3: Students represent probabilities as ratios, proportions, decimals between 0 and 1, and percentages between 0 and 100 and verify that the probabilities computed are reasonable; know that if P is the probability of an event, $1-P$ is the probability of an event not occurring.

- a. 1. You have two dice. If you throw the dice at the same time, you might have one of many possible combinations. List all those possible combinations:

(1,1), (1,2), (1,3), (1,4), (1,5), (1,6), (2,1), (2,2), (2,3), (2,4), (2,5), (2,6),
(3,1), (3,2), (3,3), (3,4), (3,5), (3,6), (4,1), (4,2), (4,3), (4,4), (4,5), (4,6),
(5,1), (5,2), (5,3), (5,4), (5,5), (5,6), (6,1), (6,2), (6,3), (6,4), (6,5), (6,6)

2. What chance do you have of getting a total of 7 dots showing for the two dice? Express the answer as a percent: 16.66...% or $1\bar{6}\%$ or $16\frac{2}{3}\%$

Six of the 36 possible outcomes from tossing two dice result in a sum of 7. They are (1,6), (2,5), (3,4), (4,3), (5,2), (6,1). Therefore the probability of rolling 7 is $\frac{6}{36}$ is $\frac{1}{6}$ or $16\frac{2}{3}\%$

- b. Use p to represent your answer to part a. What is the probability that you do NOT get a total of 7 dots showing for the two dice? 1-P

Answer Key For The California Mathematics Standards

Grade 6

Statistics, Data Analysis, and Probability 3.0: Students determine theoretical and experimental probabilities and use these to make predictions about events.

S 3.4: Students understand that the probability of either of two disjoint events occurring is the sum of the two individual probabilities and that the probability of one event following another, in independent trials, is the product of the two probabilities.

An oil prospecting firm plans to drill two exploratory wells. Past data is used to assess the following possible outcomes:

	<u>Probability</u>
Neither well produces oil or gas.	.80
Exactly one of the wells produces oil or gas	.18
Both wells produce oil or gas	.02

- a. What is the probability that at least one well will produce oil or gas?

$$.02 + .18 = 0.2$$

- b. What is the probability that neither well will produce oil or gas?

$$0.8$$

- c. What is the probability that at most one will produce oil or gas?

$$.18 + .80 = 0.98$$

Answer Key For The California Mathematics Standards

Grade 6

Statistics, Data Analysis, and Probability 3.0: Students determine theoretical and experimental probabilities and use these to make predictions about events.

S 3.5: Students understand the difference between independent and dependent events.

- a. What is the probability of tossing a die and observing an even number on the upper face of the die? $\frac{1}{2}$

The sample space for this problem is {1, 2, 3, 4, 5, 6}.
The probability of the even {2,4,6} is $\frac{3}{6} = \frac{1}{2}$

- b. A person is blindfolded and asked to draw an object from a bag. In the bag are 2 red balls and 3 green balls. After each draw the chosen ball's color is recorded and it is returned to the bag.

Are subsequent draws dependent or independent of the first draw?

Independent

- c. If a green ball is picked on the first draw (and returned to the bag), what is the probability of picking a red ball on the second draw?

$\frac{2}{5}$

Answer Key For The California Mathematics Standards Grade 6

Statistics, Data Analysis, and Probability 3.0: Students determine theoretical and experimental probabilities and use these to make predictions about events.

S 3.5: Students understand the difference between independent and dependent events.

[CONTINUED]

- e. Consider a situation where the set of objects in the bag is the same (2 red balls, 3 green balls), but after an object is drawn and its color is recorded it is not returned to the bag.

Are results of subsequent draws dependent or independent of the first draw?

Dependent

- f. If a green ball is picked on the first draw (and not returned to the bag), what is the probability of picking a red ball on the second draw?

$$\frac{2}{4} = \frac{1}{2}$$