

Answer Key For The California Mathematics Standards Grade 7

Introduction: Summary of Goals

GRADE SEVEN

By the end of grade seven, students are adept at manipulating numbers and equations and understand the general principles at work. Students understand and use factoring of numerators and denominators and properties of exponents. They know the Pythagorean theorem and solve problems in which they compute the length of an unknown side. Students know how to compute the surface area and volume of basic three-dimensional objects and understand how area and volume change with a change in scale. Students make conversions between different units of measurement. They know and use different representations of fractional numbers (fractions, decimals, and percents) and are proficient at changing from one to another. They increase their facility with ratio and proportion, compute percents of increase and decrease, and compute simple and compound interest. They graph linear functions and understand the idea of slope and its relation to ratio.

Answer Key For The California Mathematics Standards Grade 7

Number Sense 1.0: Students know the properties of, and compute with, rational numbers expressed in a variety of forms.

NS 1.1: Students read, write, and compare rational numbers in scientific notation (positive and negative powers of 10) with approximate numbers using scientific notation).

a. Write each number in scientific notation.

1. $62,000 = 6.2 \times 10^4$

2. $0.000000824 = 8.24 \times 10^{-7}$

b. Rewrite the scientific notation numbers below in standard decimal notation.

1. $4.385 \times 10^{-3} = .004385$

2. $1.8 \times 10^5 = 180,000$

c. Circle the number that is larger.

1. 5.63×10^3 or 6.28×10^2

2. 1.03×10^{-2} or 1.08×10^{-3}

d. Write each number in scientific notation, then round it to two decimal places.

1. $0.09687 = 9.687 \times 10^{-2} = 9.69 \times 10^{-2}$

2. $251,963 = 2.51963 \times 10^5 = 2.52 \times 10^5$

Answer Key For The California Mathematics Standards Grade 7

Number Sense 1.0: Students know the properties of, and compute with, rational numbers expressed in a variety of forms.

NS 1.2: Students add, subtract, multiply, and divide rational numbers (integers, fractions, and terminating decimals) and take positive rational numbers to whole-number powers.

Calculate and reduce to lowest terms when appropriate.

- a. $\frac{2}{3} + \frac{3}{5} =$

$$= \frac{10}{15} + \frac{9}{15} = \frac{19}{15} = 1\frac{4}{15}$$
- b. $\frac{0.075}{x \ 3.2} =$

$$\frac{150}{2250} \div \frac{32}{100} = \frac{150}{2250} \times \frac{100}{32} = \frac{150 \cdot 100}{2250 \cdot 32} = \frac{15000}{72000} = \frac{1}{4.8}$$
- c. $2^3 = 2 \cdot 2 \cdot 2 = 8$
- d. $-4 + (+2) = -2$
- e. $\frac{3}{8} \div \frac{9}{2} =$

$$\frac{3}{8} \div \frac{9}{2} = \frac{3}{8} \times \frac{2}{9} = \frac{1}{4} \times \frac{1}{3} = \frac{1}{12}$$
- f. $-11 - (+3) = -14$
- g. $3.54 - 0.954 =$

$$\begin{array}{r} 3.540 \\ -0.954 \\ \hline 2.586 \end{array}$$
- h. $-2(-5) = 10$
- i. $\frac{-4}{-8} = \frac{(-1) \cdot 4}{(-1) \cdot 8} = \frac{1}{2}$
- j. $\frac{3}{4} \times \frac{1}{4} = \frac{3}{16}$
- k. $\left(\frac{1}{3}\right)^5 =$

$$\frac{1}{3} \cdot \frac{1}{3} \cdot \frac{1}{3} \cdot \frac{1}{3} \cdot \frac{1}{3} = \frac{1}{243}$$
- l. $(.3)^4 =$

$$(.3) \cdot (.3) \cdot (.3) \cdot (.3) = .0081$$

Answer Key For The California Mathematics Standards Grade 7

Number Sense 1.0: Students know the properties of, and compute with, rational numbers expressed in a variety of forms.

NS 1.3: Students convert fractions to decimals and percents and use these representations in estimations, computations, and applications.

a. Complete the table

Fraction	Decimal	%
$\frac{1}{4}$	$1 \div 4 = .25$	25
$\frac{8}{100}$	$8 \div 100 = .08$	8
$\frac{3}{5}$	$3 \div 5 = .6$	60
$\frac{75}{100}$	$75 \div 100 = .75$	75

b. What is 30% of 60? $(.30) \cdot 60 = 18$

Answer Key For The California Mathematics Standards Grade 7

Number Sense 1.0: Students know the properties of, and compute with, rational numbers expressed in a variety of forms.

NS 1.4: Students differentiate between rational and irrational numbers.

Circle each rational number.

Underline each irrational number.

$$\underline{\sqrt{2}}$$

$$0.04$$

$$1.\bar{3}$$

$$\frac{14}{3}$$

$$\frac{1}{9.215}$$

$$\underline{1.010010001\dots}$$

Answer Key For The California Mathematics Standards Grade 7

Number Sense 1.0: Students know the properties of, and compute with, rational numbers expressed in a variety of forms.

NS 1.5: Students know that every rational number is either a terminating or repeating decimal and are able to convert terminating decimals into reduced fractions.

a. Write each fraction as a decimal.

1. $\frac{7}{8}$

$$\begin{array}{r} 0.875 \\ 8 \overline{)7.000} \\ \underline{64} \\ 60 \\ \underline{56} \\ 40 \\ \underline{40} \\ 0 \end{array}$$

2. $\frac{4}{3}$

$$\begin{array}{r} 1.333\dots = 1.\overline{3} \\ 3 \overline{)4.000} \\ \underline{3} \\ 10 \\ \underline{9} \\ 10 \\ \underline{9} \\ 10 \end{array}$$

b. Write each decimal as a fraction in lowest terms.

1. $0.75 = \frac{75}{100} = \frac{3 \cdot \cancel{5} \cdot \cancel{5}}{2 \cdot 2 \cdot \cancel{5} \cdot \cancel{5}} = \frac{3}{4}$

2. $0.625 = \frac{625}{1000} = \frac{5 \cdot \cancel{5} \cdot \cancel{5} \cdot \cancel{5}}{2 \cdot 2 \cdot 2 \cdot \cancel{5} \cdot \cancel{5} \cdot \cancel{5}} = \frac{5}{8}$

3. $0.80 = \frac{80}{100} = \frac{2 \cdot 2 \cdot \cancel{2} \cdot \cancel{2} \cdot \cancel{5}}{\cancel{2} \cdot \cancel{2} \cdot \cancel{5} \cdot 5} = \frac{4}{5}$

Answer Key For The California Mathematics Standards Grade 7

Number Sense 1.0: Students know the properties of, and compute with, rational numbers expressed in a variety of forms.

NS 1.6: Students calculate the percentage of increases and decreases of a quantity.

- a. A dress originally cost \$120. If it is now on sale for \$100, what is the percent of the decrease in price?

$$\text{Amount of decrease} = 120 - 100 = \$20$$

$$\frac{x}{100} = \frac{20}{120} \quad \frac{x}{100} = \frac{1}{6}$$

$$6x = 100$$

$$x = \frac{100}{6} = 16\frac{2}{3}$$

$$\% \text{ of decrease is } 16\frac{2}{3}$$

- b. Roger made a deposit of \$1,200 in his bank account. His deposit grew by 7%. What is the value of his deposit now?

$$\begin{aligned} \text{Value} &= \text{original amount} + 7\% \text{ of original amount} \\ &= \$1,200 + (0.7)(\$1,200) \\ &= \$1,200 + \$84.00 \\ &= \$1,284 \end{aligned}$$

Answer Key For The California Mathematics Standards Grade 7

Number Sense 1.0: Students know the properties of, and compute with, rational numbers expressed in a variety of forms.

NS 1.6: Students calculate the percentage of increases and decreases of a quantity.

[CONTINUED]

- c. Madeleine had \$200 to spend. After she did her shopping she had \$80 left. By what percent did her spending money decrease?

$$\begin{array}{rcl} \text{Original amount} & = & \$200 \\ \text{Amount left} & = & \$80 \\ \hline \text{Amount spent} & = & \$120 \end{array}$$

$$\frac{x}{100} = \frac{120}{200}$$

$$\frac{x}{100} = \frac{60}{100}$$

$$x = 60$$

Madeleine's spending money decreased by 60%

Answer Key For The California Mathematics Standards Grade 7

Number Sense 1.0: Students know the properties of, and compute with, rational numbers expressed in a variety of forms.

NS 1.7: Students solve problems that involve discounts, markups, commissions, and profit and compute simple and compound interest.

- a. A jacket is on sale for 70% of the original price. If the discount saves \$45, what was the original price of the jacket? What is the sale price?

C = original cost

Discount is $\frac{30}{100}$ of the original cost

Discount = \$45



$$\frac{30}{100} = \frac{45}{C}$$

$$30C = 4,500$$

$$C = \frac{4,500}{30} = \$150$$

Original cost = \$150

Sale price = \$150 - 45

= \$105

- b. Billy makes a 6% commission on all his sales. Last week he sold \$8,200 worth of merchandise. How much money did he earn in commission?

$$6\% \text{ of } \$8,200 = \$(.06) 8,200 = \$492$$

Answer Key For The California Mathematics Standards Grade 7

Number Sense 1.0: Students know the properties of, and compute with, rational numbers expressed in a variety of forms.

NS 1.7: Students solve problems that involve discounts, markups, commissions, and profit and compute simple and compound interest.

[CONTINUED]

- c. A bookseller sells paperback books with a 45% markup. If the cost to the bookseller for a book is \$14.00, how much does the bookseller charge?

$$\begin{array}{ll} \text{Markup} = 45\% \text{ of } \$14 & \text{Charge for book} = \$14 + \$6.30 \\ = (.45)14 & = \$20.30 \\ = 6.30 & \end{array}$$

- d. I invest \$800 at 5% interest compounded annually. Write, but do NOT evaluate, a numerical expression for the total value of my investment after 15 years.

$$\begin{array}{l} A = \text{Principal} + \text{Interest} = P\left(1 + \frac{r}{n}\right)^{nt} \\ P = \$800 \\ r = .05 \\ t = 15 \\ n = 1 \end{array} \quad A = 800(1 + .05)^{15}$$

- e. Debbie borrows \$1,000,000 for real estate development and makes annual interest only payments for three years at a rate of 7.5% per year. What is her total interest payment over the three year period?

$$\begin{array}{ll} P = \$1,000,000 & I = (1,000,000)(.075)(3) \\ r = .075/\text{year} & I = \$225,000 \\ t = 3 \text{ yrs} & \\ I = \text{interest payment} & \\ I = Prt & \end{array}$$

Answer Key For The California Mathematics Standards Grade 7

Number Sense 2.0: Students use exponents, powers, and roots and use exponents working with fractions.

NS 2.1: Students understand negative whole-number exponents; multiply and divide expressions involving exponents with a common base.

a. Write as a fraction.

$$1. \quad 10^{-3} = \frac{1}{10^3} = \frac{1}{1000}$$

$$2. \quad 2^{-4} = \frac{1}{2^4} = \frac{1}{2 \cdot 2 \cdot 2 \cdot 2} = \frac{1}{16}$$

b. Simplify:

$$1. \quad (2^5 \times 2^4) 2^{-3} \\ = (2^9) \cdot 2^{-3} = 2^6$$

$$2. \quad \frac{5^3 \times 5^8}{5^{15}} \\ = \frac{5^{11}}{5^{15}} = \frac{1}{5^4} = 5^{-4}$$

$$3. \quad (3^3 \times 3^3 \times 3^3) \div (3^2 \times 3^2 \times 3^2)$$

$$= \frac{3^9}{3^6} = 3^3$$

c. Write in exponential form:

$$1. \quad \frac{1}{6 \times 6 \times 6} \\ = \frac{1}{6^3} = 6^{-3}$$

$$2. \quad \frac{1}{10 \times 10 \times 10 \times 10 \times 10 \times 10} \\ = \frac{1}{10^6} = 10^{-6}$$

Answer Key For The California Mathematics Standards Grade 7

Number Sense 2.0: Students use exponents, powers, and roots and use exponents working with fractions.

NS 2.2: Students add and subtract fractions by using factoring to find common denominators.

Use factorization to find the least common denominators. Show your work.

a. $\frac{3}{8} + \frac{7}{12} =$

$$\begin{aligned} 8 &= 2 \cdot 2 \cdot 2 \\ 12 &= 2 \cdot 2 \cdot 3 \\ \text{LCM}(8,12) &= 2 \cdot 2 \cdot 2 \cdot 3 \\ &= 24 \\ \frac{3}{8} + \frac{7}{12} &= \frac{9}{24} + \frac{14}{24} = \frac{23}{24} \end{aligned}$$

b. $\frac{17}{9} + \frac{5}{3} =$

$$\begin{aligned} 9 &= 3 \cdot 3 \\ 3 &= 3 \cdot 1 \\ \text{LCM}(9,3) &= 3 \cdot 3 \\ &= 9 \\ \frac{17}{9} + \frac{5}{3} &= \frac{17}{9} + \frac{15}{9} = \frac{32}{9} \end{aligned}$$

c. $\frac{9}{10} - \frac{5}{6} =$

$$\begin{aligned} 10 &= 2 \cdot 5 \\ 6 &= 2 \cdot 3 \\ \text{LCM}(10,6) &= 2 \cdot 3 \cdot 5 \\ &= 30 \\ \frac{9}{10} - \frac{5}{6} &= \frac{27}{30} - \frac{25}{30} = \frac{2}{30} = \frac{1}{15} \end{aligned}$$

Number Sense 2.0: Students use exponents, powers, and roots and use exponents working with fractions.

NS 2.3: Students multiply, divide, and simplify rational numbers by using exponent rules.

a. Rewrite using factors and exponents, then simplify.

1. $\frac{1000}{100}$

$$= \frac{10^3}{10^2} = 10^1 = 10$$

2. $\frac{9}{81}$

$$= \frac{9^1}{9^2} = \frac{1}{9}$$

3. $\frac{4}{64}$

$$= \frac{2^3}{2^6} = \frac{1}{2^4} = \frac{1}{16}$$

b. Work each item. Write the answer as a regular fraction.

1. $\frac{(3 \times 3)}{(6 \times 6 \times 6)} \times \frac{(6 \times 6)}{(3 \times 3 \times 3)}$

$$\begin{aligned} &= \frac{3^2 \cdot 6^2}{6^3 \cdot 3^3} = 3^{2-3} \cdot 6^{2-3} \\ &= 3^{-1} \cdot 6^{-1} \\ &= \frac{1}{3} \cdot \frac{1}{6} = \frac{1}{18} \end{aligned}$$

2. $(\frac{2^3}{2^5}) \div (\frac{2^0}{2^2})$

$$\begin{aligned} &= \frac{2^3}{2^5} \cdot \frac{2^2}{2^0} \\ &= \frac{2^5}{2^5} = 1 \end{aligned}$$

Answer Key For The California Mathematics Standards Grade 7

Number Sense 2.0: Students use exponents, powers, and roots and use exponents working with fractions.

NS 2.4: Students use the inverse relationship between raising to a power and extracting the root of a perfect square integer; for an integer that is not a square, determine without a calculator the two integers between which its square root lies and explain why.

a. Find the positive square root:

1. 144

$$\begin{aligned}\sqrt{144} &= \\ \sqrt{12 \cdot 12} &= \\ 12 &\end{aligned}$$

2. $2^6 \cdot 3^4$

$$\begin{aligned}\sqrt{2^6 \cdot 3^4} &= \\ \sqrt{(2^3)^2 \cdot (3^2)^2} &= \\ 2^3 \cdot 3^2 &= 72\end{aligned}$$

3. 196

$$\begin{aligned}\sqrt{196} &= \\ \sqrt{14^2} &= \\ 14 &\end{aligned}$$

b. Between which 2 whole numbers does the square root lie?
Do not use a calculator. Explain your answer.

1. 60

$$\begin{aligned}49 &< 60 < 64 \\ \sqrt{49} &< \sqrt{60} < \sqrt{64} \\ 7 &< \sqrt{60} < 8\end{aligned}$$

2. 12

$$\begin{aligned}9 &< 12 < 16 \\ \sqrt{9} &< \sqrt{12} < \sqrt{16} \\ 3 &< \sqrt{12} < 4\end{aligned}$$

3. 115

$$\begin{aligned}100 &< 115 < 121 \\ \sqrt{100} &< \sqrt{115} < \sqrt{121} \\ 10 &< \sqrt{115} < 11\end{aligned}$$

Answer Key For The California Mathematics Standards Grade 7

Number Sense 2.0: Students use exponents, powers, and roots and use exponents working with fractions.

NS 2.5: Students understand the meaning of the absolute value of a number; interpret the absolute value as the distance of the number from zero on a number line; and determine the absolute value of real numbers.

Write the absolute value of each number:

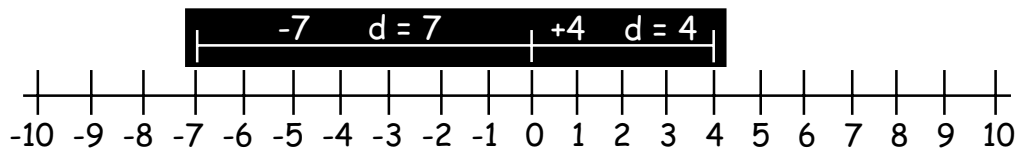
a. $|-15| = 15$ b. $|+8| = 8$ c. $|12| = 12$ d. $|-20| = 20$

e. Which of the four numbers above has the largest absolute value?

d

f. Show the absolute value of (+4) as a distance on the number line below.

g. Trace a line segment on the number line below to show the absolute value of (-7) as a distance.



Answer Key For The California Mathematics Standards

Grade 7

Algebra and Functions 1.0: Students express quantitative relationships by using algebraic terminology, expressions, equations, inequalities, and graphs.

AF 1.1: Students use variables and appropriate operations to write an expression, an equation, an inequality, or a system of equations or inequalities that represent a verbal description (e.g., three less than a number, half as large as area A).

a. Write as a mathematical expression:

1. 5 less than R $R - 5$

2. One fourth as large as the area, where the area = A $\frac{1}{4}A$

3. 25 more than Z $Z + 25$

b. Write as a mathematical equation:

1. Y is 3 more than twice the value of X $y = 2x + 3$

2. Z is 6 less than two fifths the value of Q $Z = \frac{2}{5}Q - 6$

3. X is less than 7 times the value of $\frac{1}{3}$ the price, where the price = A

$$x < 7\left(\frac{1}{3}A\right)$$

Answer Key For The California Mathematics Standards Grade 7

Algebra and Functions 1.0: Students express quantitative relationships by using algebraic terminology, expressions, equations, inequalities, and graphs.

AF 1.1: Students use variables and appropriate operations to write an expression, an equation, an inequality, or a system of equations or inequalities that represent a verbal description (e.g., three less than a number, half as large as area A).

[CONTINUED]

c. Express mathematically:

1. D is $\frac{3}{4}$ the size of R

$$D = \frac{3}{4}R$$

2. R is twice the size of Q

$$R = 2Q$$

3. Write an equation to express D in terms of Q

$$D = \frac{3}{4}R = \frac{3}{4}(2Q) \quad D = \frac{6}{4}Q = \frac{3}{2}Q \quad D = \frac{3}{2}Q$$

Answer Key For The California Mathematics Standards Grade 7

Algebra and Functions 1.0: Students express quantitative relationships by using algebraic terminology, expressions, equations, inequalities, and graphs.

AF 1.2: Students use the correct order of operations to evaluate algebraic expressions such as $3(2x + 5)^2$.

Let $x = 3$ and $y = 2$. Substitute to find the value of the expressions below:

a. $\frac{y(xy - 7)}{10} =$

$$\frac{2(3 \cdot 2 - 7)}{10} = \frac{2(6 - 7)}{10} = \frac{2(-1)}{10} = \frac{-2}{10} = \frac{-1}{5}$$

b. $\frac{[2(x + 5) - \frac{1}{2}(5x - 3)]^2}{10}$

$$= \frac{[2(3 + 5) - \frac{1}{2}(5 \cdot 3 - 3)]^2}{10} = \frac{[2(8) - \frac{1}{2}(12)]^2}{10}$$

$$= \frac{[16 - 6]^2}{10} = \frac{10^2}{10} = 10$$

Answer Key For The California Mathematics Standards Grade 7

Algebra and Functions 1.0: Students express quantitative relationships by using algebraic terminology, expressions, equations, inequalities, and graphs.

AF 1.3: Students simplify numerical expressions by applying properties of rational numbers (e.g., identity, inverse, distributive, associative, commutative) and justify the process used.

Justify each equation below with one of the following properties: additive identity, commutative property of addition, commutative property of multiplication, associative property of addition, associative property of multiplication, or the distributive property.

a) $xy (y + -y) = xy (0)$

Additive identity

b) $y (a + b) = ya + yb$

Distributive property

c) $y (a + b) = (a + b) y$

Commutative property of multiplication

d) $(2 + x) + y = 2 + (x + y)$

Associative property of addition

e) $xy + y = y + xy$

Commutative property of addition

f) $y [(x + y) z] = [y (x + y)]z$

Associative property of multiplication

Answer Key For The California Mathematics Standards Grade 7

Algebra and Functions 1.0: Students express quantitative relationships by using algebraic terminology, expressions, equations, inequalities, and graphs.

AF 1.4: Students use algebraic terminology (e.g., variable, equation, term, coefficient, inequality, expression, constant) correctly.

a. For the equation, $y = 2x + 5$

1. Name the variables. **x, y**
2. What is the coefficient of x ? **2**
3. What is the constant? **5**

b. How many terms? $3x^2 + 5x - 7$ **3**

c. State whether each item is an expression, equation, or inequality

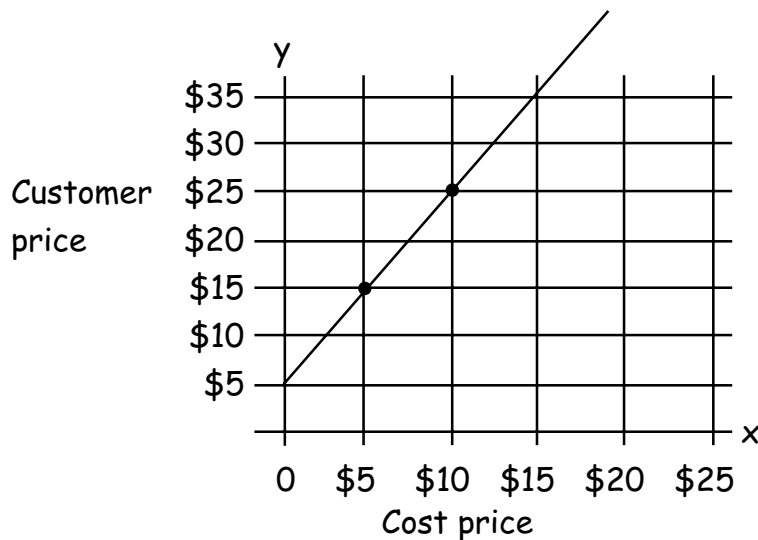
1. $y > 2x + 1$ **inequality**
2. $y = 5x^2 + 3x - 2$ **equation**
3. $5(7x - 2) + 3$ **expression**
4. $x^2 - 1 \neq y$ **inequality**

Answer Key For The California Mathematics Standards Grade 7

Algebra and Functions 1.0: Students express quantitative relationships by using algebraic terminology, expressions, equations, inequalities, and graphs.

AF 1.5: Students represent quantitative relationships graphically and interpret the meaning of a specific part of a graph in the situation represented by the graph.

- a. The graph below shows the relationship of the cost price of items in a catalogue to the customer price, including a standard mailing charge of \$5



1. If the cost price is \$10, how much is the customer price?

\$25

2. Why does the graph touch the y axis at the point for \$5

The minimum cost is \$5 for mailing. This cost is applied before any item is purchased.

3. If the customer pays \$15, what is the cost of the article bought?

\$5

Answer Key For The California Mathematics Standards Grade 7

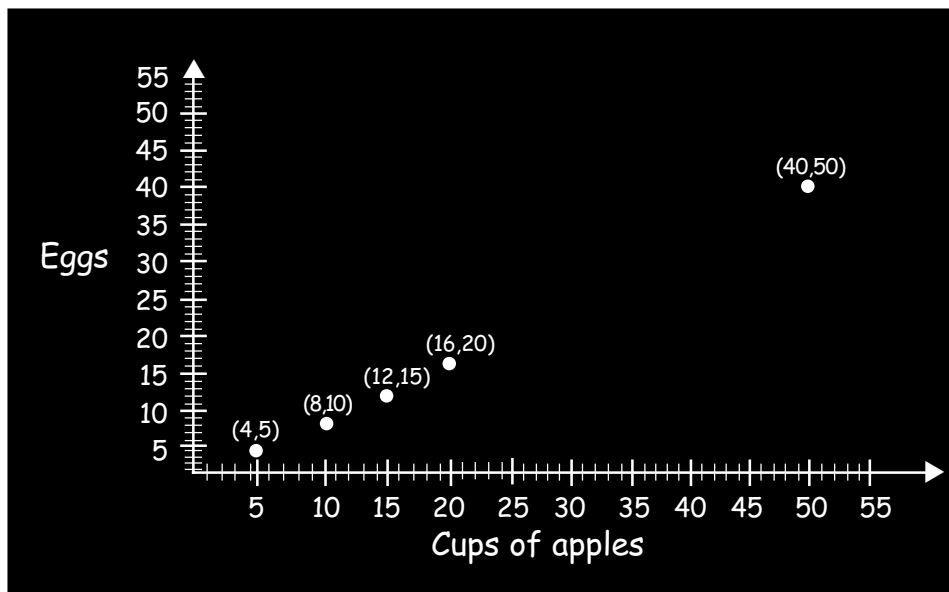
Algebra and Functions 1.0: Students express quantitative relationships by using algebraic terminology, expressions, equations, inequalities, and graphs.

AF 1.5: Students represent quantitative relationships graphically and interpret the meaning of a specific part of a graph in the situation represented by the graph.

[CONTINUED]

- b. Below is a chart showing the ratio of eggs to cups of apples in a recipe. Complete the chart, and represent the relationship on the graph below.

eggs	4	12	16	8	40
apples	5	15	20	10	50



Answer Key For The California Mathematics Standards Grade 7

Algebra and Functions 2.0: Students interpret and evaluate expressions involving integer powers and simple roots.

AF 2.1: Students interpret positive whole-number powers as repeated multiplication and negative whole-number powers as repeated division or multiplication by the multiplicative inverse. Simplify and evaluate expressions that include exponents.

Express each of the following in simplest form using exponents:

<p>a. $4 \cdot 4 \cdot 4 \cdot 4 \cdot 4$</p> <div style="background-color: black; color: white; padding: 5px; width: fit-content; margin-left: 100px;"> $= 4^5$ </div>	<p>b. $\frac{1}{6 \cdot 6 \cdot 6}$</p> <div style="background-color: black; color: white; padding: 5px; width: fit-content; margin-left: 100px;"> $= \frac{1}{6^3} = 6^{-3}$ </div>	<p>c. $10 \cdot 10 \cdot 10$</p> <div style="background-color: black; color: white; padding: 5px; width: fit-content; margin-left: 100px;"> $= 10^3$ </div>
---	--	---

Algebra and Functions 2.0: Students interpret and evaluate expressions involving integer powers and simple roots.

AF 2.2: Students multiply and divide monomials; extend the process of taking powers and extracting roots to monomials when the latter results in a monomial with an integer exponent.

a. Find the square root. Assume all variables are positive.

1. $\frac{4mr^2r}{t \cdot 9 \cdot p^2 \cdot t}$

$$\sqrt{\frac{4mr^2r}{t \cdot 9 \cdot p^2 \cdot t}} =$$

$$\sqrt{\frac{4(mr)^2}{9p^2t^2}} =$$

$$\frac{2mr}{3pt}$$

2. $2x^2(2y^4)$

$$\sqrt{2x^2(2y^4)} =$$

$$\sqrt{4x^2y^4} =$$

$$2xy^2$$

3. $\frac{2z(8z^3)}{4p(16p)}$

$$\sqrt{\frac{2z^1(8z^3)}{4p^1(16p^1)}} =$$

$$\sqrt{\frac{16z^4}{64p^2}} =$$

$$\frac{4z^2}{8p} = \frac{z^2}{2p}$$

Answer Key For The California Mathematics Standards Grade 7

Algebra and Functions 2.0: Students interpret and evaluate expressions involving integer powers and simple roots.

AF 2.2: Students multiply and divide monomials; extend the process of taking powers and extracting roots to monomials when the latter results in a monomial with an integer exponent.

[CONTINUED]

b. Simplify and square each expression.

1. $4x \cdot 2y$

$$(4x \cdot 2y)^2 =$$

$$(8xy)^2 =$$

$$64x^2y^2$$

2. $\frac{3m^3}{9mx}$

$$\left(\frac{3m^3}{9mx}\right)^2 =$$

$$\left(\frac{m^2}{3x}\right)^2 =$$

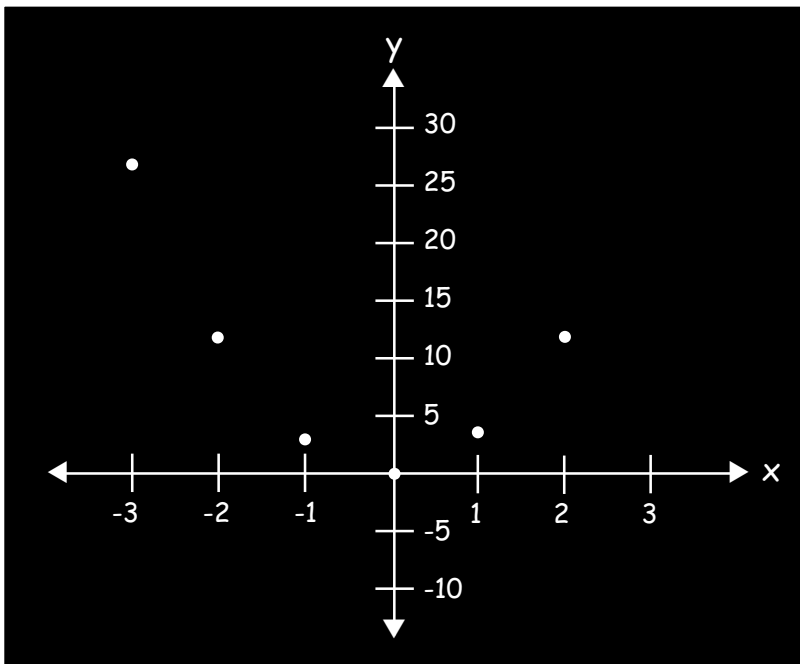
$$\frac{m^4}{9x^2}$$

Answer Key For The California Mathematics Standards Grade 7

Algebra and Functions 3.0: Students graph and interpret linear and some nonlinear functions.

AF 3.1: Students graph functions of the form $y = nx^2$ and $y = nx^3$ and use in solving problems.

a. **$y = 3x^2$** Plot the graph for the following values: $x = 0, x = 1, x = 2, x = -1, x = -2, x = -3$



x	y
0	0
1	3
2	12
-1	3
-2	12
-3	27

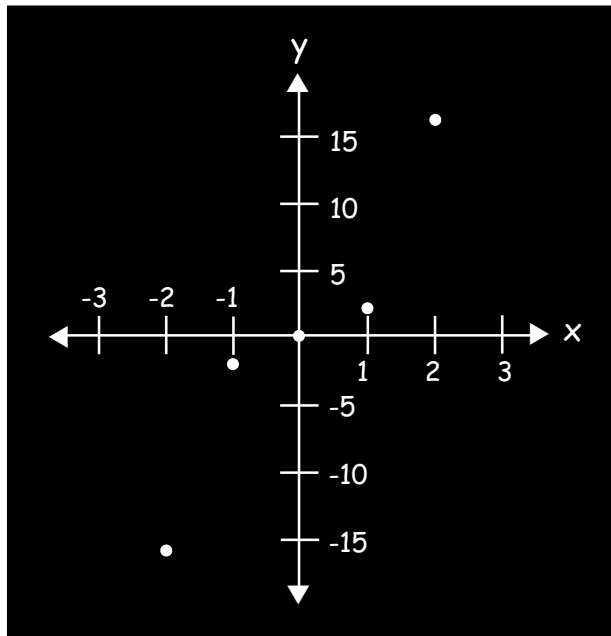
Answer Key For The California Mathematics Standards Grade 7

Algebra and Functions 3.0: Students graph and interpret linear and some nonlinear functions.

AF 3.1: Students graph functions of the form $y = nx^2$ and $y = nx^3$ and use in solving problems.

[CONTINUED]

b. $y = 2x^3$ Plot the graph for the following values: $x = 0, x = 1, x = 2, x = -1, x = -2$



x	y
0	0
1	2
2	16
-1	-2
-2	-16

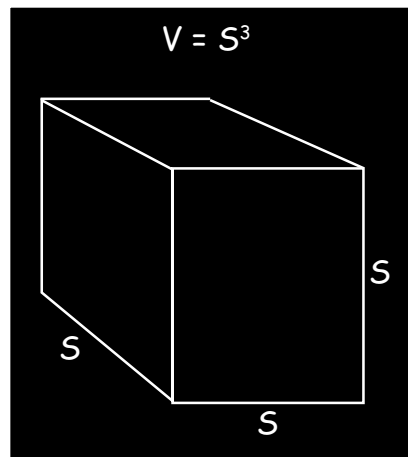
Answer Key For The California Mathematics Standards Grade 7

Algebra and Functions 3.0: Students graph and interpret linear and some nonlinear functions.

AF 3.2: Students plot the values from the volumes of three-dimensional shapes for various values of the edge lengths (e.g., cubes with varying edge lengths or a triangular prism with a fixed height and an equilateral triangle base of varying heights).

- a. Complete the following table for the volume V of a cube with side length S .

S	V
1	$1^3 = 1$
2	$2^3 = 8$
3	$3^3 = 27$



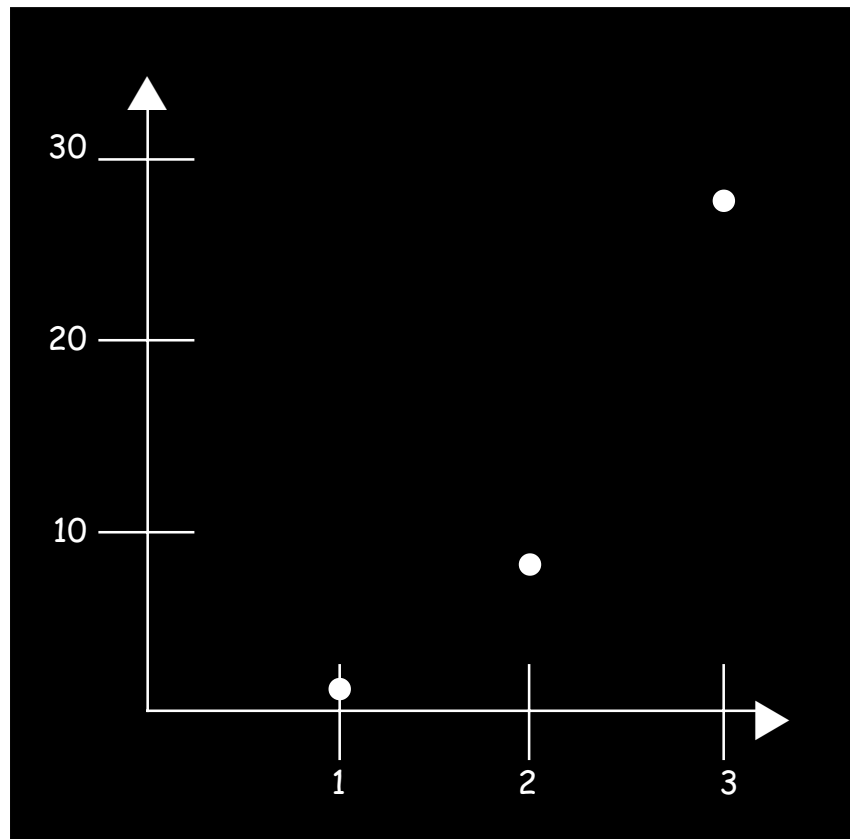
Answer Key For The California Mathematics Standards Grade 7

Algebra and Functions 3.0: Students graph and interpret linear and some nonlinear functions.

AF 3.2: Students plot the values from the volumes of three-dimensional shapes for various values of the edge lengths (e.g., cubes with varying edge lengths or a triangle prism with a fixed height and an equilateral triangle base of varying heights).

[CONTINUED]

b. Plot the points from your table on the graph below.

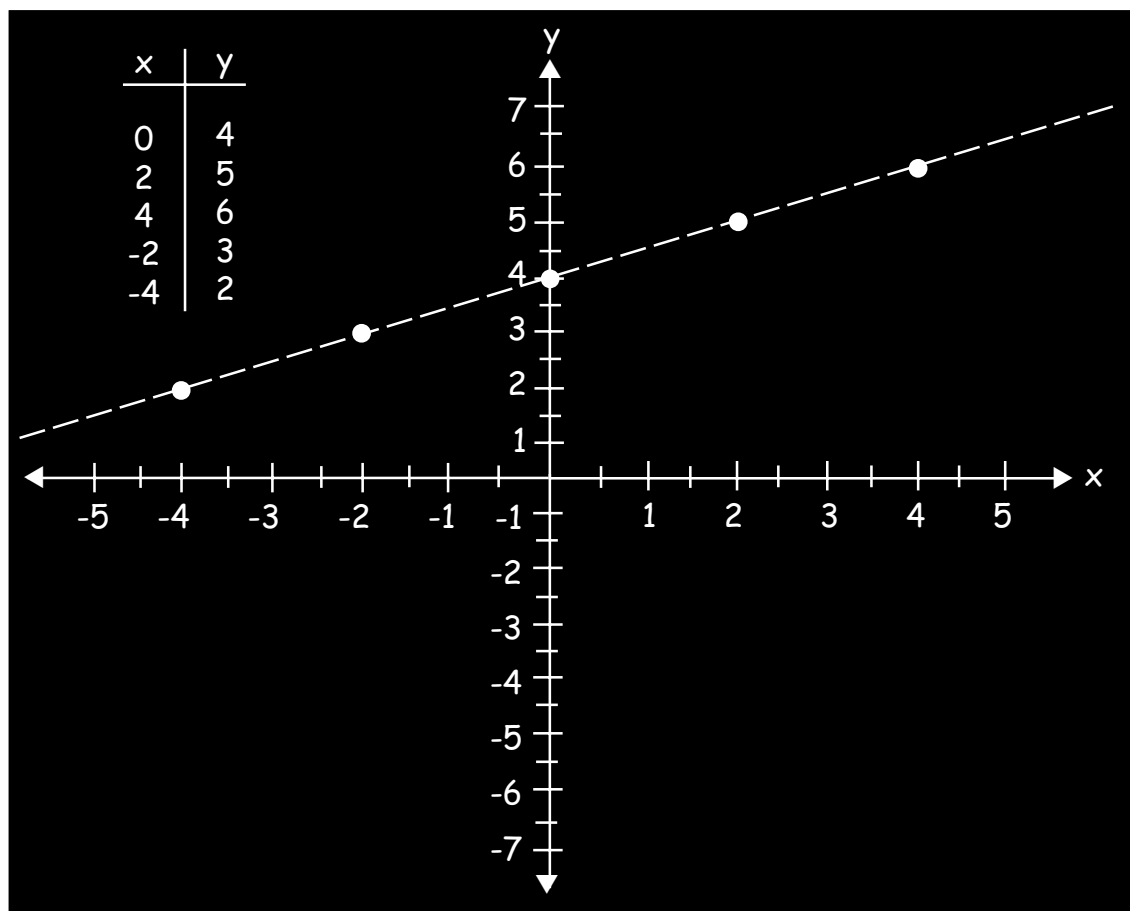


Answer Key For The California Mathematics Standards Grade 7

Algebra and Functions 3.0: Students graph and interpret linear and some nonlinear functions.

AF 3.3: Students graph linear functions, noting that the vertical change (change in y -value) per unit of horizontal change (change in x -value) is always the same and know that the ratio ("rise over run") is called the slope of a graph.

- a. $y = \frac{1}{2}x + 4$ Plot the points on the graph corresponding to $x = 0, x = 2, x = 4, x = -2, x = -4$. Also graph the function $y = \frac{1}{4}x + 4$.



- b. What is the slope of the graph you have plotted?

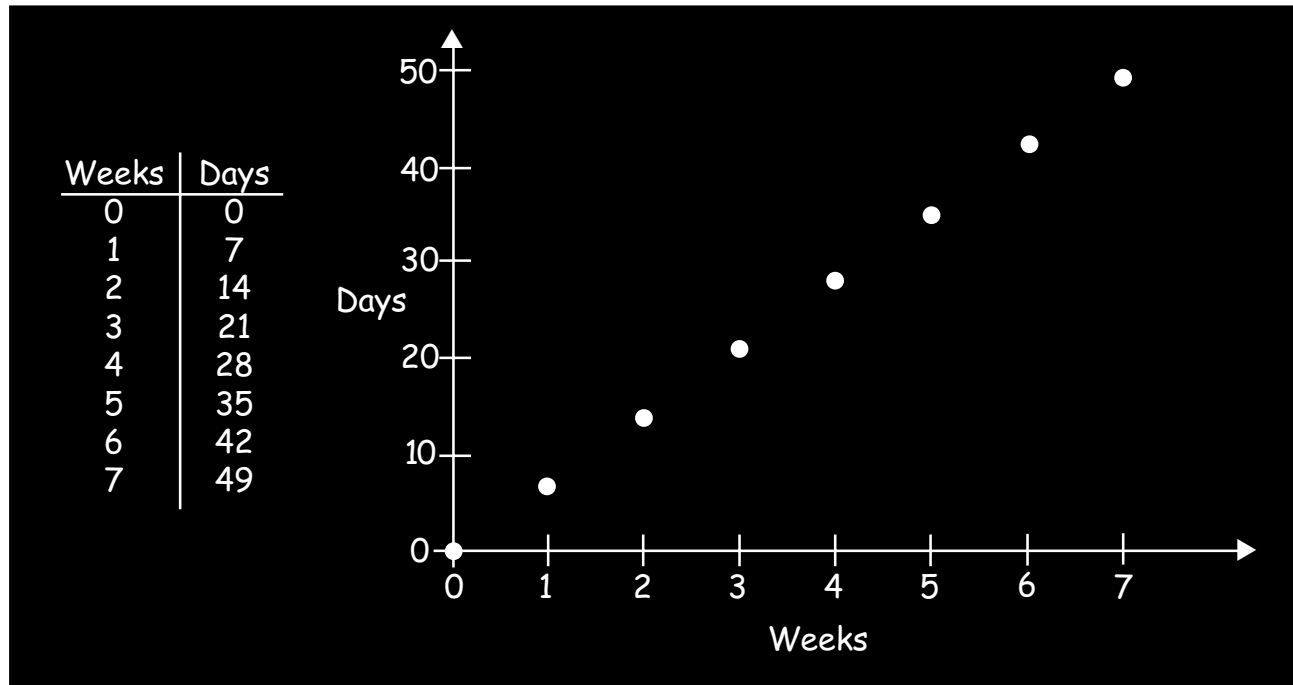
$$\text{slope } m = \frac{1}{2}$$

Answer Key For The California Mathematics Standards Grade 7

Algebra and Functions 3.0: Students graph and interpret linear and some nonlinear functions.

AF 3.4: Students plot the values of quantities whose ratios are always the same (e.g., cost to the number of an item, feet to inches, diameter of a circle). Fit a line to the plot and understand that the slope of the line equals the quantities.

- a. Use the relationship between days and weeks to plot a graph showing the number of days for 1 week through 7 weeks.



- b. What does the slope of the graph represent?

Slope = 7 = number of days in one week

Slope represents $\frac{\text{rise}}{\text{run}}$

Answer Key For The California Mathematics Standards Grade 7

Algebra and Functions 4.0: Students solve simple linear equations and inequalities over the rational numbers.

AF 4.1: Students solve two-step linear equations and inequalities in one variable over the rational numbers, interpret the solution or solutions in the context from which they arose, and verify the reasonableness of the results.

- a. $y = 4x - 5$ If $y = -\frac{5}{2}$, what does x equal? Verify your answer by substitution.

$$\begin{aligned} -\frac{5}{2} &= 4x - 5 & 4x &= \frac{5}{2} \\ -\frac{5}{2} + 5 &= 4x & x &= \frac{5}{8} \\ \text{Check: } 4\left(\frac{5}{8}\right) - 5 &= \frac{5}{2} - 5 = -\frac{5}{2} \end{aligned}$$

- b. $y \leq 2.5x - 2.5$ If $y = 5$, what is the smallest x could be?

$$\begin{aligned} 5 &\leq 2.5x - 2.5 & \frac{7.5}{2.5} &\leq \frac{2.5x}{2.5} \\ 5 + 2.5 &\leq 2.5x - 2.5 + 2.5 & 3 &\leq x \\ 7.5 &\leq 2.5x & x &\geq 3 \\ & & \text{Smallest value of } x &\text{ is } 3 \end{aligned}$$

Answer Key For The California Mathematics Standards Grade 7

Algebra and Functions 4.0: Students solve simple linear equations and inequalities over the rational numbers.

AF 4.1: Students solve two-step linear equations and inequalities in one variable over the rational numbers, interpret the solution or solutions in the context from which they arose, and verify the reasonableness of the results.

[CONTINUED]

- c. If you add 6 years to Johnny's age, then divide by 3, you find his brother's age. His brother is 12. How old is Johnny? Write an equation where B represents the brother's age and J represents Johnny's age.

J = Johnny's age
B = brother's age

$$\frac{J+6}{3} = B$$

$$J + 6 = 36$$

$$J = 30$$

$$\frac{J+6}{3} = 12$$

Johnny is 30 years old

Answer Key For The California Mathematics Standards Grade 7

Algebra and Functions 4.0: Students solve simple linear equations and inequalities over the rational numbers.

AF 4.2: Students solve multi-step problems involving rate, average speed, distance, and time or a direct variation.

- a. Johnny drove at 32 miles per hour for 30 minutes and at 48 miles per hour for 45 minutes. How far did he travel?

Let d_1 = the distance travelled for the first 30 minutes and
 d_2 = the distance travelled for the next 45 minutes.

30 mins = $\frac{1}{2}$ hr, 45 mins = $\frac{3}{4}$ hr. From the rate equation $d = rt$,

$$d_1 = 32 \frac{\text{mi}}{\text{hr}} \cdot \frac{1}{2} \text{hr} = 16 \text{mi}$$

$$d_2 = 48 \frac{\text{mi}}{\text{hr}} \cdot \frac{3}{4} \text{hr} = 36 \text{mi}$$

The total distance travelled is $d_1 + d_2 = 16 \text{mi} + 36 \text{mi} = 52 \text{mi}$

- b. A machine produces pencils at the rate of 480 per hour. A newer model produces pencils at the rate of 14 per minute. At the end of 2 hours, how many pencils are produced if they both work together?

Machine 1 produces 480 pencils/hr
Machine 2 produces 14 pencils/min = $\frac{14 \text{ pencils}}{\text{min}} \times \frac{60 \text{ mins}}{\text{hour}} = \frac{840 \text{ pencils}}{\text{hour}}$

In 2 hours, number of pencils produced =

$$\frac{480 \text{ pencils}}{\text{hr}} \cdot 2 \text{ hrs} + \frac{840 \text{ pencils}}{\text{hr}} \cdot 2 \text{ hrs} =$$

$$960 \text{ pencils} + 1,680 \text{ pencils} = 2,640 \text{ pencils}$$

Answer Key For The California Mathematics Standards Grade 7

Measurement and Geometry 1.0: Students choose appropriate units of measure and use ratios to convert within and between measurement systems to solve problems.

MG 1.1: Students compare weights, capacities, geometric measures, times, and temperatures within and between measurement systems (e.g., miles per hour and feet per second, cubic inches to cubic centimeters).

A conveyer belt moves at a rate of 8 miles in 4 hours. How many feet per minute does the belt move? (1 mile = 5,280 feet).

$$\begin{aligned}\frac{8 \text{ mi}}{4 \text{ hrs}} &= 2 \frac{\text{mi}}{\text{hr}} \\ &= 2 \frac{\text{mi}}{\text{hr}} \times 5,280 \frac{\text{ft}}{\text{mi}} \times \frac{1 \text{ hr}}{60 \text{ min}} \\ &= \frac{5,280 \text{ ft}}{30 \text{ min}} = \frac{528 \text{ ft}}{3 \text{ min}} \\ &= 176 \frac{\text{ft}}{\text{min}}\end{aligned}$$

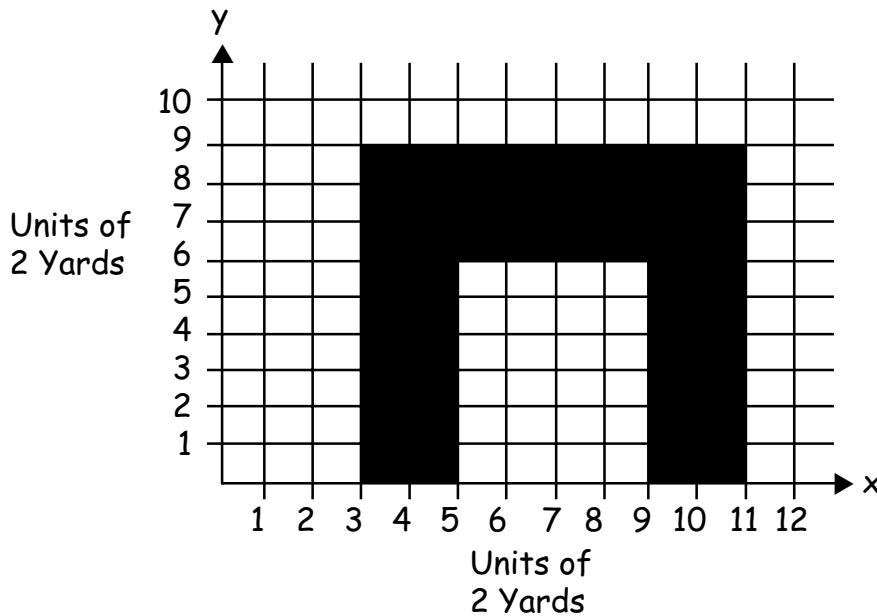
Answer Key For The California Mathematics Standards Grade 7

Measurement and Geometry 1.0: Students choose appropriate units of measure and use ratios to convert within and between measurement systems to solve problems.

MG 1.2: Students construct and read drawings and models made to scale.

The graph shows a plan view of a single story building. Each division on the x and y axes represent a distance of 2 yards.

- a. What is the square yardage of the building?
- b. What is the square footage of the building?



$$\begin{aligned}
 \text{a) } A &= 4(8 \cdot 9) - 4(4 \cdot 6) \\
 &= 4(72) - 4(24) \\
 &= 4(72 - 24) \\
 &= 4(48) \\
 &= 192 \text{ yd}^2
 \end{aligned}$$

$$\begin{aligned}
 \text{b) } 1\text{yd} &= 3\text{ft} \\
 1 \text{ yd}^2 &= 9\text{ft}^2
 \end{aligned}$$

$$\begin{aligned}
 \text{Therefore } 192 \text{ yd}^2 &= 192 \text{ yd}^2 \cdot \frac{9\text{ft}^2}{\text{yd}^2} \\
 &= 192 \cdot 9 \text{ ft}^2 \\
 &= 1,728 \text{ ft}^2
 \end{aligned}$$

Answer Key For The California Mathematics Standards

Grade 7

Measurement and Geometry 1.0: Students choose appropriate units of measure and use ratios to convert within and between measurement systems to solve problems.

MG 1.3: Students use measures expressed as rates (e.g., speed, density) and measures expressed as products (e.g., person-days) to solve problems; check the units of the solutions; and use dimensional analysis to check the reasonableness of the answer.

a. A project will take a total of 480 person-days to complete.

1. How many days will it take to complete the project if 3 people work on the project?

Let n = # of days to complete the job

480 person-days means $\frac{1}{480}$ of the job is done by 1 person per day

$$\frac{1}{480} \cdot \# \text{ of workers} \cdot \# \text{ of days} = 1$$

$$\frac{1}{480} \cdot 3 \cdot n = 1$$

$$\frac{3}{480} \cdot n = 1$$

$$n = \frac{480}{3} = 160 \text{ days}$$

2. If the project must be completed in 20 days, how many people must be employed?

Let P = # of people needed

$$\frac{1}{480} \cdot P \cdot 20 = 1$$

$$\frac{20}{480} \cdot P = 1$$

$$P = \frac{480}{20}$$

$$P = 24$$

24 people are needed to complete the job in 20 days

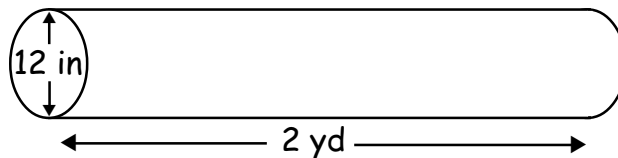
Answer Key For The California Mathematics Standards Grade 7

Measurement and Geometry 1.0: Students choose appropriate units of measure and use ratios to convert within and between measurement systems to solve problems.

MG 1.3: Students use measures expressed as rates (e.g., speed, density) and measures expressed as products (e.g., person-days) to solve problems; check the units of the solutions; and use dimensional analysis to check the reasonableness of the answer.

[CONTINUED]

- b. The density of a solid bar is 15 lbs. per cubic ft. What is the weight of the bar?



$$\text{Density} = d = 15 \frac{\text{lbs}}{\text{ft}^3}$$

Volume of bar:

$$V = \pi r^2$$

$$= \pi \cdot \left(\frac{12}{2} \text{ft}\right)^2 \cdot \left(2 \text{yd} \cdot \frac{3 \text{ft}}{\text{yd}}\right)$$

$$= \pi \cdot (6 \text{ft})^2 \cdot 6 \text{ft}$$

$$= \pi \cdot 216 \text{ft}^3$$

$$\text{Weight} = Vd = 15 \frac{\text{lbs}}{\text{ft}^3} \cdot 216 \pi \text{ft}^3 = 3,240 \cdot \pi \text{lbs}$$

Answer Key For The California Mathematics Standards Grade 7

Measurement and Geometry 1.0: Students choose appropriate units of measure and use ratios to convert within and between measurement systems to solve problems.

MG 1.3: Students use measures expressed as rates (e.g., speed, density) and measures expressed as products (e.g., person-days) to solve problems; check the units of the solutions; and use dimensional analysis to check the reasonableness of the answer.

[CONTINUED]

- c. A car is traveling at an average speed of 44 mph. How long will it take the car to travel 99 miles?

The distance formula is $d = rt$. Here $r = 44 \frac{\text{mi}}{\text{hr}}$

$$d = 99 \text{ mi, and } t = \text{no. of hours} \quad 44t = 99$$

$$t = \frac{99}{44} = \frac{9}{4}$$

$$= 2\frac{1}{4} \text{ hrs or 2 hrs and 15 minutes.}$$

- d. What are the units of

$$\frac{2 \text{ feet}}{\text{second}} \times \frac{3 \text{ seconds}}{\text{hour}} \times \frac{4 \text{ hours}}{\text{day}} \times \frac{5 \text{ days}}{\text{year}}$$

$$\frac{2 \text{ feet}}{\cancel{\text{second}}} \times \frac{3 \cancel{\text{seconds}}}{\cancel{\text{hour}}} \times \frac{4 \cancel{\text{hours}}}{\cancel{\text{day}}} \times \frac{5 \cancel{\text{days}}}{\text{year}}$$

$$\frac{\text{feet}}{\text{year}}$$

Answer Key For The California Mathematics Standards Grade 7

Measurement and Geometry 2.0: Students compute the perimeter, area, and volume of common geometric objects and use the results to find measures of less common objects. They know how perimeter, area, and volume are affected by changes of scale.

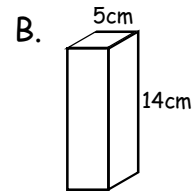
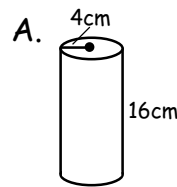
MG 2.1: Students use formulas routinely for finding the perimeter and area of basic two-dimensional figures and the surface area and volume of basic three-dimensional figures, including rectangles, parallelograms, trapezoids, squares, triangles, circles, prisms, and cylinders.

a. Examine the figures to the right.

1. Find the volume of figure A.

$$V_A = \pi \cdot r^2 \cdot h = \pi \cdot (4\text{cm})^2 \cdot 16\text{cm}$$

$$V_A = \pi \cdot 16\text{cm}^2 \cdot 16\text{cm} = 256\pi\text{cm}^3$$



The base is a square

2. Find the volume of figure B.

$$V_B = l \cdot w \cdot h = 5\text{cm} \cdot 5\text{cm} \cdot 14\text{cm} = 350\text{cm}^3$$

3. Find the surface area of figure A.

Area of 2 bases + lateral area

$$S_A = 2\pi r^2 + 2\pi r h = 2\pi(4\text{cm})^2 + 2\pi(4\text{cm})(16\text{cm})$$

$$= 32\pi\text{cm}^2 + 128\pi\text{cm}^2 = 160\pi\text{cm}^2$$

4. Find the surface area of figure B.

Area of 2 bases + lateral area

$$S_B = 2 \cdot 5\text{cm} \cdot 5\text{cm} + 4 \cdot 5\text{cm} \cdot 14\text{cm}$$

$$= 50\text{cm}^2 + 280\text{cm}^2$$

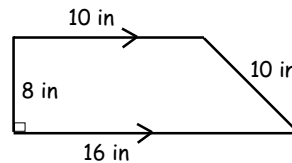
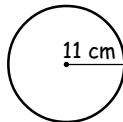
$$= 330\text{cm}^2$$

Answer Key For The California Mathematics Standards Grade 7

Measurement and Geometry 2.0: Students compute the perimeter, area, and volume of common geometric objects and use the results to find measures of less common objects. They know how perimeter, area, and volume are affected by changes of scale.

MG 2.1: Students use formulas routinely for finding the perimeter and area of basic two-dimensional figures and the surface area and volume of basic three-dimensional figures, including rectangles, parallelograms, trapezoids, squares, triangles, circles, prisms, and cylinders.

[CONTINUED]



- b. What is the circumference of the circle?

$$\begin{aligned}C &= 2 \cdot \pi \cdot r \\ &= 2 \cdot \pi \cdot 11\text{cm} = 22\pi \text{ cm}\end{aligned}$$

- c. What is the area of the circle?

$$\begin{aligned}A &= \pi \cdot r^2 \\ &= \pi \cdot (11\text{cm})^2 = \pi \cdot 121\text{cm}^2 = 121\pi\text{cm}^2\end{aligned}$$

- d. What is the area of the trapezoid?

$$\begin{aligned}A &= \frac{1}{2}(b_1 + b_2) \cdot h \\ &= \frac{1}{2}(10\text{in} + 16\text{in}) \cdot 8 \text{ in} = \frac{1}{2}(26\text{in}) \cdot 8 \text{ in} = 104\text{in}^2\end{aligned}$$

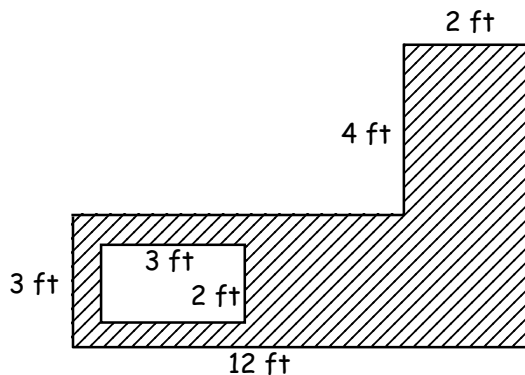
- e. What is the perimeter of the trapezoid?

$$\begin{aligned}P &= \text{sum of lengths of sides} \\ &= 8\text{in} + 16\text{in} + 10\text{in} + 10\text{in} = 44\text{in}\end{aligned}$$

Answer Key For The California Mathematics Standards Grade 7

Measurement and Geometry 2.0: Students compute the perimeter, area, and volume of common geometric objects and use the results to find measures of less common objects. They know how perimeter, area, and volume are affected by changes of scale.

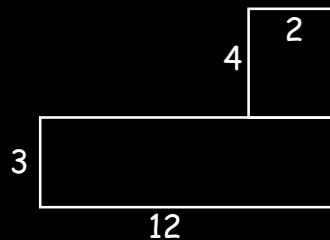
MG 2.2: Students estimate and compute the area of more complex or irregular two- and three-dimensional figures by breaking the figures down into more basic geometric objects.



- a. This diagram shows a kitchen counter with an area cut out for the sink. What is the area of the counter top?

Area = area of figure - area for sinks

1) Subdivide large figure into rectangles and calculate areas



$$A = (3\text{ft} \cdot 12\text{ft}) + (4\text{ft} \cdot 2\text{ft}) \\ = 36\text{ft}^2 + 8\text{ft}^2 = 44\text{ft}^2$$

$$2) \text{ Area of sink} = (3\text{ft})(2\text{ft}) \\ = 6\text{ft}^2$$

$$3) \text{ Subtract} \\ \text{net area} = 44\text{ft}^2 - 6\text{ft}^2 \\ = 38\text{ft}^2$$

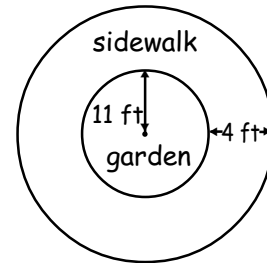
Answer Key For The California Mathematics Standards Grade 7

Measurement and Geometry 2.0: Students compute the perimeter, area, and volume of common geometric objects and use the results to find measures of less common objects. They know how perimeter, area, and volume are affected by changes of scale.

MG 2.2: Students estimate and compute the area of more complex or irregular two- and three-dimensional figures by breaking the figures down into more basic geometric objects.

[CONTINUED]

- b. This diagram shows a sidewalk around a circular garden. What is the area of the sidewalk?

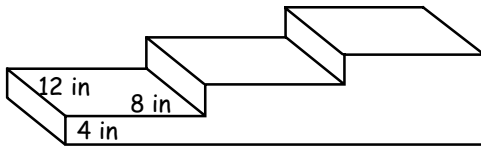


$$\begin{aligned}A_{\text{sidewalk}} &= A_{\text{outer circle}} - A_{\text{inner circle}} \\A_{\text{sidewalk}} &= \pi \cdot (15\text{ft})^2 - \pi \cdot (11\text{ft})^2 \\&= 225\pi\text{ft}^2 - 121\pi\text{ft}^2 \\&= 104\pi\text{ft}^2\end{aligned}$$

Answer Key For The California Mathematics Standards Grade 7

Measurement and Geometry 2.0: Students compute the perimeter, area, and volume of common geometric objects and use the results to find measures of less common objects. They know how perimeter, area, and volume are affected by changes of scale.

MG 2.3: Students compute the length of the perimeter, the surface area of the faces, and the volume of a three-dimensional object built from rectangular solids. Students understand that when the lengths of all dimensions are multiplied by a scale factor, the surface area is multiplied by the square of the scale factor and the volume is multiplied by the cube of the scale factor.



Each step is 4 inches high,
8 inches deep and 12 inches wide.

- a. What is the volume of the entire unit?

$$\begin{aligned} &\text{Divide into 3 sections} \\ V &= 4 \cdot 8 \cdot 12 + 8 \cdot 8 \cdot 12 + 12 \cdot 8 \cdot 12 \\ &= (4 + 8 + 12) 8 \cdot 12 \\ &= 24 \cdot 8 \cdot 12 = 2,304 \text{ in}^3 \end{aligned}$$

- b. What is the surface area of the entire unit?

$$\begin{aligned} A &= \text{area of top \& bottom} + \text{area of front \& back} + \text{area of 2 sides} \\ &= 2(12\text{in} \cdot 24\text{in}) + 2(12\text{in} \cdot 12\text{in}) + 2(4\text{in} \cdot 8\text{in} + 8\text{in} \cdot 8\text{in} + 12 \cdot 8\text{in}) \\ &= 2(288\text{in}^2) + 2(144\text{in}^2) + 2(32\text{in}^2 + 64\text{in}^2 + 96\text{in}^2) \\ &= 576\text{in}^2 + 288\text{in}^2 + 384\text{in}^2 \\ &= 1,248\text{in}^2 \end{aligned}$$

Answer Key For The California Mathematics Standards

Grade 7

Measurement and Geometry 2.0: Students compute the perimeter, area, and volume of common geometric objects and use the results to find measures of less common objects. They know how perimeter, area, and volume are affected by changes of scale.

MG 2.3: Students compute the length of the perimeter, the surface area of the faces, and the volume of a three-dimensional object built from rectangular solids. Students understand that when the lengths of all dimensions are multiplied by a scale factor, the surface area is multiplied by the square of the scale factor and the volume is multiplied by the cube of the scale factor.

[CONTINUED]

A model of the step unit will be built to scale. Each dimension will be half the actual size.

- c. What fraction of the volume of the real staircase will the volume of the model be?

The volume of the staircase is a sum of volumes of rectangular prisms. The volume of a prism is given by $V=lwh$. If each dimension is halved, the volume of each new rectangular prism for the model is $V_{\text{model}} = \frac{1}{2}l \cdot \frac{1}{2}w \cdot \frac{1}{2}h = \frac{1}{8}lwh = \frac{1}{8}V$. Since each rectangular prism is reduced by a factor of $\frac{1}{8}$, the volume of the model is $\frac{1}{8}$ the volume of the original.

- d. What fraction of the surface area of the real staircase will the surface area of the model be?

The surface area of the staircase is a sum of areas of rectangles. The area of a rectangle is given by $A=lw$. If each dimension is halved, the area of each new rectangle for the model is $A_{\text{model}} = \frac{1}{2}l \cdot \frac{1}{2}w = \frac{1}{4}lw = \frac{1}{4}A$. Since each rectangular portion of the surface is reduced by a factor of $\frac{1}{4}$, the surface area of the model is $\frac{1}{4}$ the surface area of the original.

Answer Key For The California Mathematics Standards Grade 7

Measurement and Geometry 2.0: Students compute the perimeter, area, and volume of common geometric objects and use the results to find measures of less common objects. They know how perimeter, area, and volume are affected by changes of scale.

MG 2.4: Students relate the changes in measurement with a change of scale to the units used (e.g., square inches, cubic feet) and to conversions between units (1 square foot = 144 square inches, cubic feet) and to conversions between units (1 square foot = 144 square inches or $[1 \text{ ft}^2] = [144 \text{ in}^2]$, 1 cubic inch is approximately 16.38 cubic centimeters or $[1 \text{ in}^3] = [16.38 \text{ cm}^3]$).

- a) The volume of a box is $\frac{100}{(2.54)^2}$ cubic inches. Using the fact that 1 inch = 2.54 centimeters, find the volume of the box in cubic centimeters.

$$\begin{aligned}\frac{100}{(2.54)^2} \text{ in}^3 &= \frac{100}{(2.54)^2} \text{ in}^3 \times \left(2.54 \frac{\text{cm}}{\text{in}}\right)^3 \\ &= \frac{100}{(2.54)^2} \times (2.54)^3 \text{ in}^3 \frac{\text{cm}^3}{\text{in}^3} \\ &= 100 \times 2.54 \text{ cm}^3 \\ &= 254 \text{ cm}^3\end{aligned}$$

- b) The surface area of a ball is 288 square inches. How many square feet is this?

$$\begin{aligned}288 \text{ in}^2 &= 288 \text{ in}^2 \left(\frac{1 \text{ ft}}{12 \text{ in}}\right)^2 \\ &= 288 \text{ in}^2 \times \frac{1 \text{ ft}^2}{144 \text{ in}^2} \\ &= \frac{288}{144} \text{ ft}^2 \\ &= 2 \text{ ft}^2\end{aligned}$$

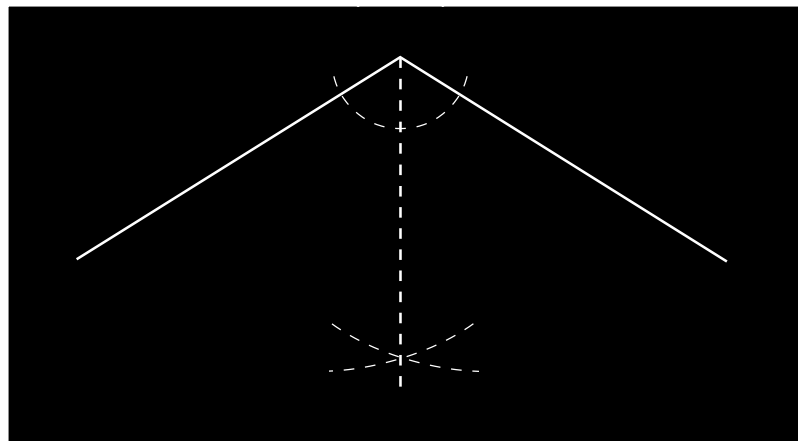
Answer Key For The California Mathematics Standards Grade 7

Measurement and Geometry 3.0: Students know the Pythagorean theorem and depend their understanding of plane and solid geometric shapes by constructing figures that meet given conditions and by identifying attributes of figures.

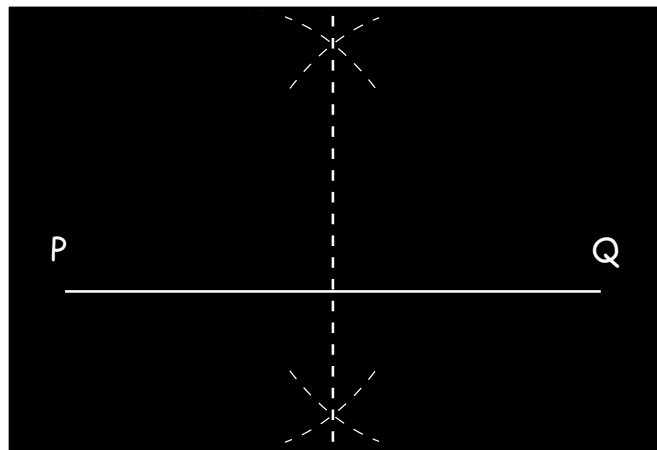
MG 3.1: Students identify and construct basic elements of geometric figures (e.g., altitudes, mid-points, diagonals, angle bisectors, and perpendicular bisectors; central angles, radii, diameters, and chords of circles) by using a compass and straightedge.

Use a compass and a straight edge to construct the following. Do not erase compass marks.

- a. bisect the angle



- b. Make a line perpendicular to the segment PQ that also bisects the segment.



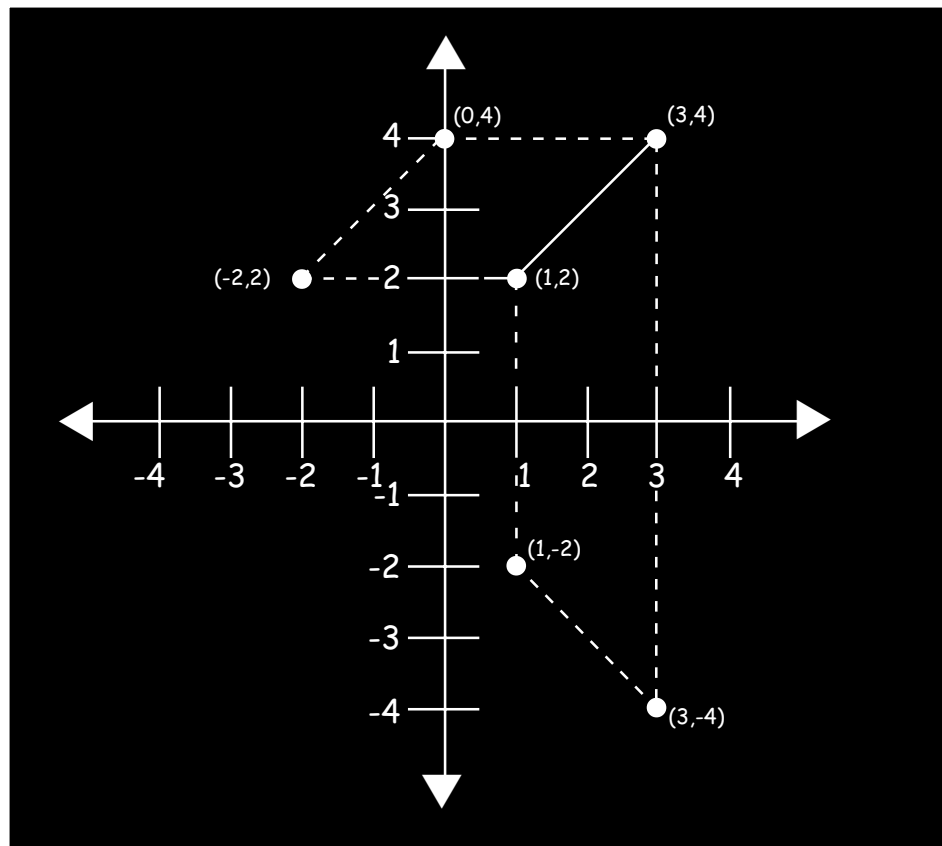
Answer Key For The California Mathematics Standards Grade 7

Measurement and Geometry 3.0: Students know the Pythagorean theorem and deepen their understanding of plane and solid geometric shapes by constructing figures that meet given conditions and by identifying attributes of figures.

MG 3.2: Students understand and use coordinate graphs to plot simple figures, determine lengths and areas related to them, and determine their image under translations and reflections.

Plot the points $(1, 2)$ and $(3, 4)$ on the graph below.

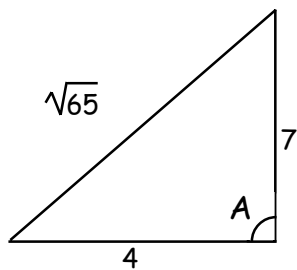
- If the line segment with endpoints $(1, 2)$ and $(3, 4)$ is translated 3 units to the left, what are the coordinates of the end points of the resulting line segment? Graph the translated line segment. **$(-2, 2)$ and $(0, 4)$**
- If the line segment with endpoints $(1, 2)$ and $(3, 4)$ is reflected through the x-axis, what are the coordinates of the end points of the resulting line segment. Graph the reflected line segment. **$(1, -2)$ and $(3, -4)$**



Answer Key For The California Mathematics Standards Grade 7

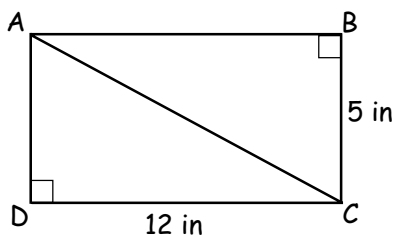
Measurement and Geometry 3.0: Students know the Pythagorean theorem and depend their understanding of plane and solid geometric shapes by constructing figures that meet given conditions and by identifying attributes of figures.

MG 3.3: Students know and understand the Pythagorean theorem and its converse and use it to find the length of the missing side of a right triangle and the lengths of other line segments and, in some situations, empirically verify the Pythagorean theorem by direct measurement.



- a. The triangle has sides of lengths 4, 7 and $\sqrt{65}$. What is the degree measure of angle A? Show your work.

Since $4^2 + 7^2 = (\sqrt{65})^2$, and by the converse of the Pythagorean Theorem, angle A is 90°



- b. Figure out the length of the diagonal AC.

$$\begin{aligned}AC^2 &= 12^2 + 5^2 \\AC^2 &= 144 + 25 \\AC^2 &= 169 \\AC &= \sqrt{169} \\AC &= 13 \text{ in}\end{aligned}$$

Answer Key For The California Mathematics Standards Grade 7

Measurement and Geometry 3.0: Students know the Pythagorean theorem and deepen their understanding of plane and solid geometric shapes by constructing figures that meet given conditions and by identifying attributes of figures.

MG 3.4: Students demonstrate an understanding of conditions that indicate two geometrical figures are congruent and what congruence means about the relationships between the sides and angles of the two figures.

A triangle is congruent to a second triangle whose sides have lengths 4, 3 and 6. What is the perimeter of the first triangle?

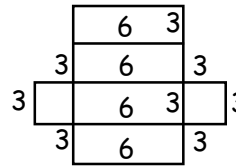
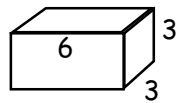
$$P = 4 + 3 + 6 = 13$$

Since the triangles are congruent they have equal perimeters

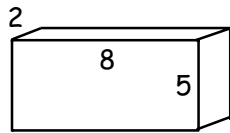
Answer Key For The California Mathematics Standards Grade 7

Measurement and Geometry 3.0: Students know the Pythagorean theorem and deepen their understanding of plane and solid geometric shapes by constructing figures that meet given conditions and by identifying attributes of figures.

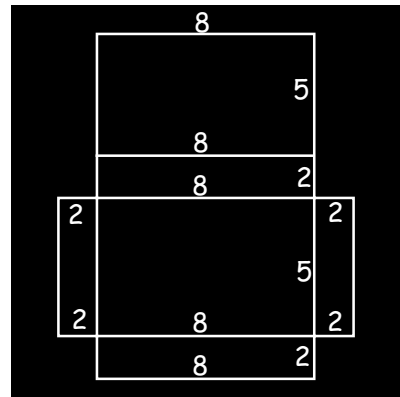
MG 3.5: Students construct two-dimensional patterns for three-dimensional models, such as cylinders, prisms, and cones.



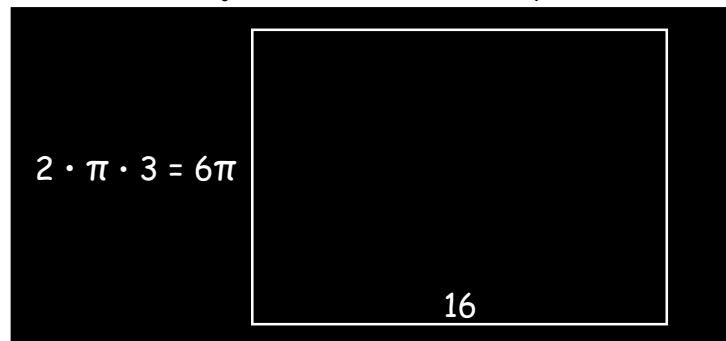
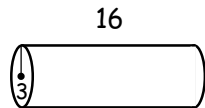
By folding up the shape on the right, you can make the box on the left.



a. Draw a diagram which can be folded to make this box.



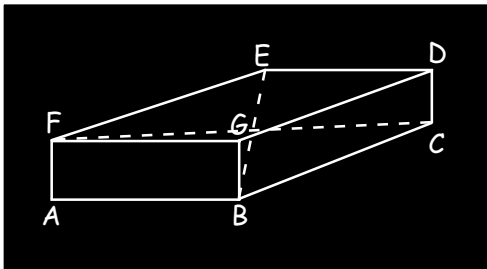
b. Draw a diagram which can be wrapped and joined to make this cylinder



Answer Key For The California Mathematics Standards Grade 7

Measurement and Geometry 3.0: Students know the Pythagorean theorem and deepen their understanding of plane and solid geometric shapes by constructing figures that meet given conditions and by identifying attributes of figures.

MG 3.6: Students identify elements of three-dimensional geometric objects (e.g., diagonals of rectangular solids) and describe how two or more objects are related in space (e.g., skew lines, the possible ways three planes might intersect).



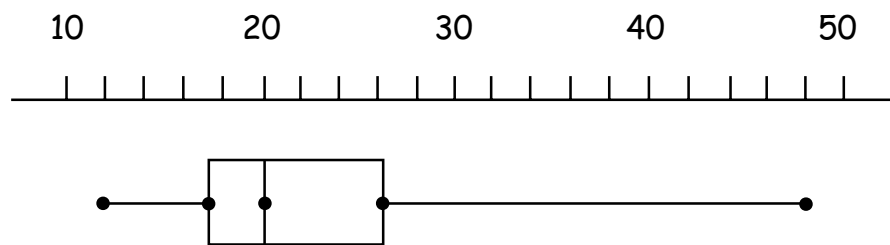
- a. Draw a diagonal of this rectangular solid from point C and another diagonal from point B.

Answer Key For The California Mathematics Standards Grade 7

Statistics, Data Analysis and Probability 1.0: Students collect, organize, and represent data sets that have one or more variables and identify relationships among variables within a data set by hand and through the use of an electronic spreadsheet software program.

SDP 1.1: Students know various forms of display for data sets, including a stem-and-leaf plot or box-and-whisker plot; use the forms to display a single set of data or to compare two sets of data.

The box and whisker plot below shows the dollar prices of twenty popcorn poppers as listed in *Consumer Reports Buying Guide, 1991*.



Source: *Consumer Reports Buying Guide, 1991*.

- a. Approximately how much did the most expensive popcorn popper cost?

\$48

- b. Approximately how much did the least expensive popcorn popper cost?

\$12

- c. What was the median price for a popcorn popper?

\$20

Answer Key For The California Mathematics Standards Grade 7

Statistics, Data Analysis and Probability 1.0: Students collect, organize, and represent data sets that have one or more variables and identify relationships among variables within a data set by hand and through the use of an electronic spreadsheet software program.

SDP 1.2: Students represent two numerical variables on a scatterplot and informally describe how the data points are distributed and any apparent relationship that exists between the two variables (e.g., between time spent on homework and grade level).

This data shows the average amount of time 20 children, aged between six and twelve years old, spent on homework last week.

- a. Represent the data as a scatter plot on the graph provided.

	AGE	TIME		AGE	TIME
1.	6	8 min	11.	9	64 min
2.	6	20 min	12.	9	80 min
3.	6	38 min	13.	9	50 min
4.	7	20 min	14.	10	66 min
5.	7	25 min	15.	10	90 min
6.	7	40 min	16.	11	78 min
7.	8	50 min	17.	11	65 min
8.	8	60 min	18.	11	80 min
9.	8	52 min	19.	12	52 min
10.	9	30 min	20.	12	108 min

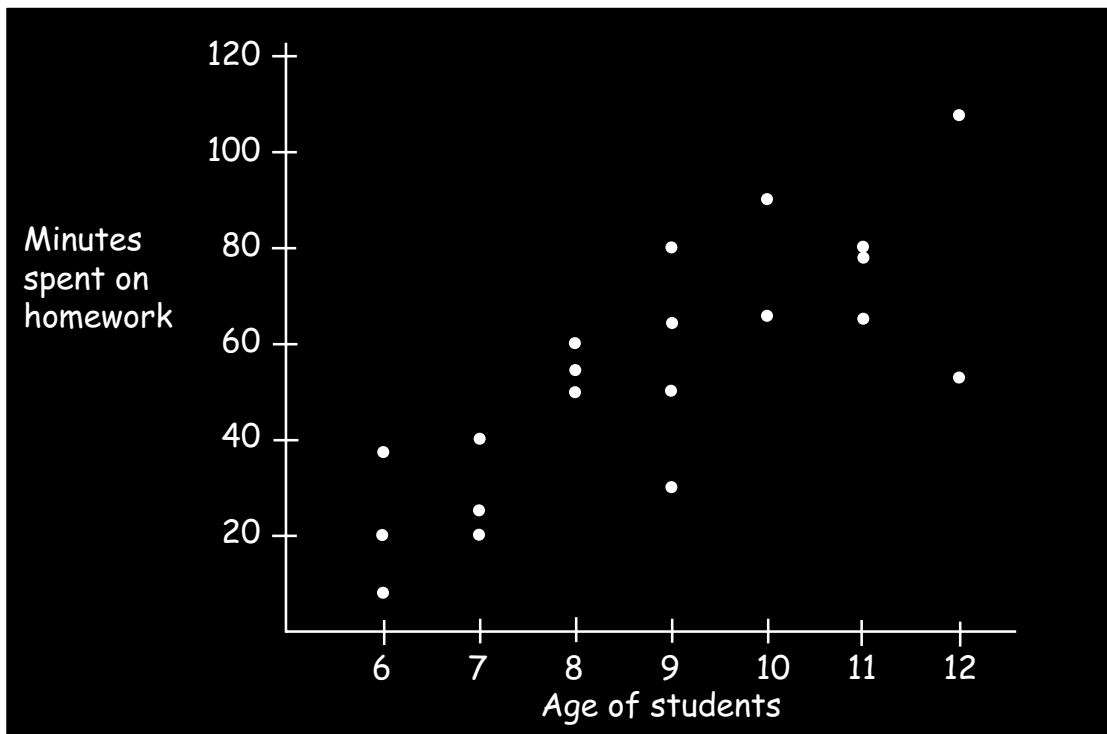
CONTINUES ON NEXT PAGE

Answer Key For The California Mathematics Standards Grade 7

Statistics, Data Analysis and Probability 1.0: Students collect, organize, and represent data sets that have one or more variables and identify relationships among variables within a data set by hand and through the use of an electronic spreadsheet software program.

SDP 1.2: Students represent two numerical variables on a scatterplot and informally describe how the data points are distributed and any apparent relationship that exists between the two variables (e.g., between time spent on homework and grade level).

[CONTINUED]



b. Do you see a relationship between age and time spent on homework?

Generally, the older a student, the more time spent on homework

c. What is the range in time spent on homework? Look at the scores for 7 year olds.

Scores range from 20 to 40. The range is 20 for seven year olds.

Answer Key For The California Mathematics Standards Grade 7

Statistics, Data Analysis and Probability 1.0: Students collect, organize, and represent data sets that have one or more variables and identify relationships among variables within a data set by hand and through the use of an electronic spreadsheet software program.

SDP 1.3: Students understand the meaning of, and are able to compute, the minimum, the lower quartile, the median, the upper quartile, and the maximum of a data set.

This data represents 12 scores on a math test:

4, 4, 7, 9, 12, 14, 18, 19, 20, 21, 22, 27

- a. What is the median score?

$$\frac{14 + 18}{2} = 16. \text{ The median score is } 16$$

- b. What is the highest score?

27

- c. What is the lowest score?

4

- d. The cut off for the lower quartile lies between which two scores?

7 and 9

- e. The cut off for the upper quartile lies between which two scores?

20 and 21