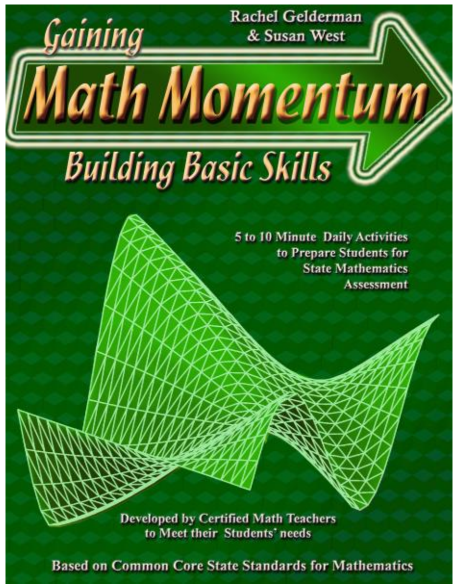
Gaining Math Momentum: Building Basic Skills
Preview



Thank you for your interest in our product, *Gaining Math Momentum: Building Basic Skills*. This preview was created to present the key features of our resource book (also available on CD-ROM) and includes the Table of Contents, A Message from the Authors, Index by Course Content (topics typically covered in high school math courses), five complete problem pages with their corresponding solution pages, one of the five tutorial sections as well as the first page of the Quick Reference Answer Key. We hope that this preview clearly shows you all that this dynamic resource has to offer!

For more information on any of our products, email us at *ripplestowaves@gmail.com.*

Rachel Gelderman & Susan West
Ripples~to~Waves Publications

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Table of Contents

A Message from the Authors:

As math teachers, we have found that many high school students seem to struggle with basic math skills such as fractions, decimals, percents, operations with integers and the order of operations. Students often avoid learning the algebraic process by guessing and checking answers, attempting to remember rules with no meaning or making inappropriate associations between concepts. Students also seem to lack "math sense" or an understanding of whether a process or an answer is reasonable. These fundamental skill deficits prevent students from succeeding in algebra and geometry as well as on standardized tests. Students who are unsuccessful feel that they cannot "do math" and lack confidence in their ability. We developed this book to strengthen their skills, allowing these students to grow in their basic understanding of mathematics.

We focused on a few **simple goals**:

- To build students' basic math skills
- To make connections between reasoning and mathematical processes
- To develop students' understanding of the algebraic process
- To improve students' math sense and assessment of reasonableness
- To build students' confidence and competence on a daily basis

Key features of this book include:

- Multiple choice format based on the design of numerous state standardized tests
- Topics addressed in a random order similar to most standardized tests
- Specific problem pages designed to be completed without a calculator
- Three levels of difficulty on each page (easy, moderate and hard but not in the same order on each page) and difficulty level increases as students work through the book
- Detailed solutions for every question (methods shown reinforce development of basic mathematical processes)
- Common Core State Standards for Mathematics listed for each problem – standards available at **www.thecorestandards.org/assets/CCSSI_Math%20Standards.pdf**
- Most appropriate Mathematical Practice from the Common Core Standards noted for each problem (although more than one practice often applies)
- Course content index (topics typically covered in high school math courses)
- Extra tutorial sections for student reference on math terminology and notation as well as fractions, decimals, percents and operations with integers
- Pdf page files available on CD-ROM (sold separately) can be displayed on an interactive white board or data projector
- Quick reference answer key
- Basic mathematical formulas presented on last page (students are encouraged to use their individual state's formula sheet)

As students use this book to prepare for standardized tests, our hope is that they will gain the momentum and confidence necessary to succeed in math. We feel that both teachers and individual students will benefit from this instructional supplement.

Rachel Gelderman & Susan West

Index by Course Content

This index is organized by topics covered in typical high school math courses.
Problems are referenced by page number followed by problem number
(e.g. 4.3 represents Page 4 Problem 3).

Arithmetic (Numbers and Operations)

Index by Course Content

Algebra

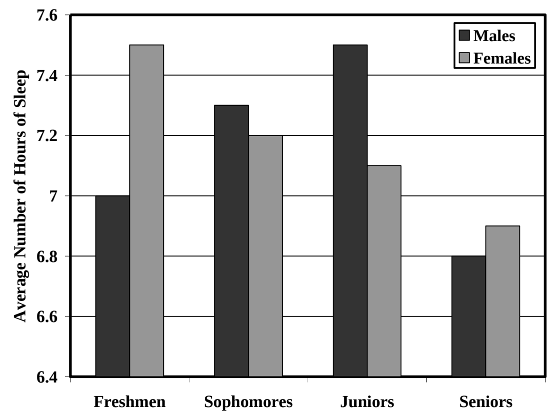
Index by Course Content

Geometry

Probability and Statistics

Common Core Standard: 2.MD.10, 5.NBT.7
Mathematical Practices: *Attend to precision.*

1. Because Clark, a junior at Metropolis High, sleeps in math class, students were asked to develop a survey to determine the average number of hours high school students sleep on a daily basis. The survey results are shown in the histogram to the right. How many more hours does the average junior boy sleep than the average junior girl?



A 7.5 hours

B 7.1 hours

C 4.0 hours

D 0.4 hours

Common Core Standard: 7.EE.4.b, A-REI.3
Mathematical Practices: *Reason abstractly and quantitatively.*

2. Solve the inequality: $4x + 6 < 12$

A $x < 6$

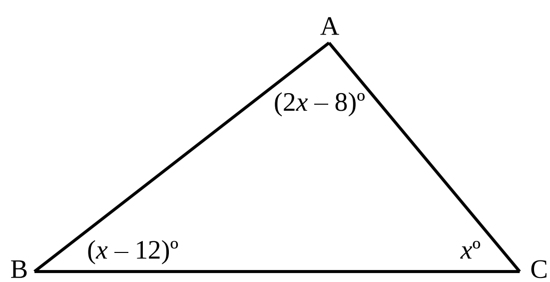
B $x > \frac{2}{3}$

C $x < \frac{3}{2}$

D No solution

Common Core Standard: 7.G.5, 8.EE.7, A-REI.3
Mathematical Practices: *Make sense of problems and persevere in solving them.*

3. Find the measure of $\angle$B.



A 28º

B 38º

C 40º

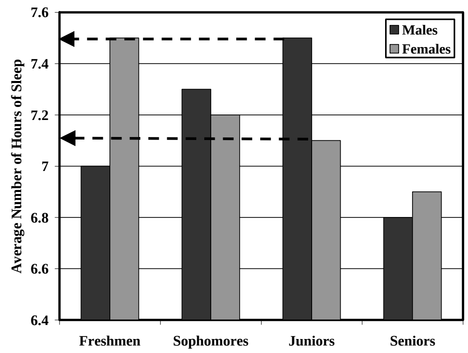
D 50º

In this preview, the solution pages follow their corresponding problem pages.

1. **(D)** According to the histogram, junior boys sleep an average of 7.5 hours on a daily basis and junior girls sleep an average of 7.1 hours. To find how many more hours the average junior boy sleeps than the average junior girl, find the difference between these two numbers.

$$7.5 - 7.1 = 0.4 \text{ hours}$$

Need more help with decimal subtraction? See T23.



2. **(C)** Solve as follows:

$$4x + 6 < 12$$

Subtract 6 from both sides: $4x < 6$

Divide both sides by 4: $x < \frac{6}{4}$

Simplify: $x < \frac{3}{2}$

Need more help with simplifying fractions? See T12.

Note: The inequality sign is reversed only when multiplying or dividing by a negative number.

3. **(B)** To find the measure of $\angle$B ($m\angle$B), recall that the sum of the measures of the angles of a triangle is 180 degrees which produces the equation:

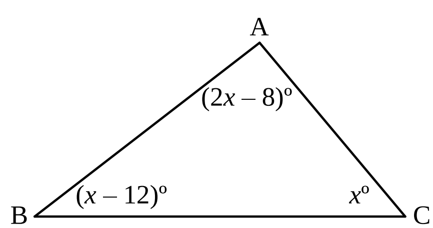
$$m\angle A + m\angle B + m\angle C = 180^{o}$$

Substitute: $2x - 8 + x - 12 + x = 180$

Combine like terms: $4x - 20 = 180$

Add 20 to both sides: $4x = 200$

Divide both sides by 4: $x = 50$



Substitute 50 for x in the expression for the measure of $\angle$B ($m\angle$B):

$$m\angle B = x - 12 = 50 - 12 = 38$$

Therefore $\angle$B measures 38^{o}.

Common Core Standard: 5.NF.1
Mathematical Practices: *Attend to precision.*

1. Simplify: $4\frac{1}{5} - 1\frac{3}{7}$

   A $3\frac{2}{12}$

   B $3\frac{2}{35}$

   C $2\frac{27}{35}$

   D 2

Common Core Standard: 8.SP.2
Mathematical Practices: *Look for and make use of structure.*

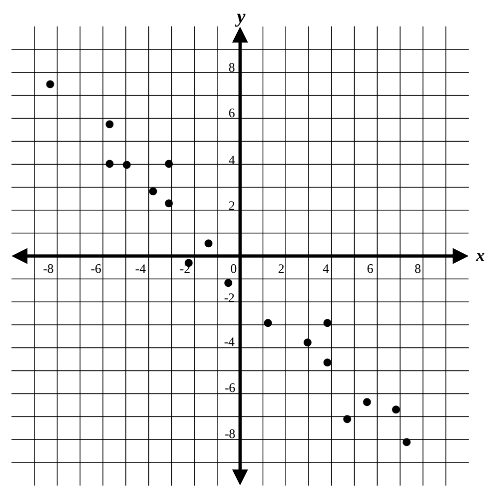
2. Given the scatter plot, find the line of best fit.

   A $y = -x - 1$

   B $y = x - 1$

   C $y = -3x + 1$

   D $y = 3x + 1$



Common Core Standard: 6.RP.3.d
Mathematical Practices: *Reason abstractly and quantitatively.*

3. How many square inches are in one square foot?

   A 12 square inches

   B 24 square inches

   C 48 square inches

   D 144 square inches

In this preview, the solution pages follow their corresponding problem pages.

1. **(C)** Begin by changing both mixed numbers to improper fractions. Then subtract by finding a common denominator. In this case, the lowest common denominator is 35. Simplify as follows:

$$4\tfrac{1}{5} - 1\tfrac{3}{7}$$

Change to improper fractions: $= \frac{21}{5} - \frac{10}{7}$

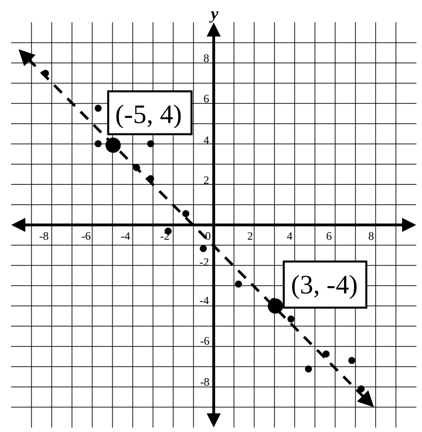
Produce fractions equivalent to $\frac{21}{5}$ and $\frac{10}{7}$ with a common denominator of 35: $= \frac{21}{5} \bullet \frac{7}{7} - \frac{10}{7} \bullet \frac{5}{5} = \frac{147}{35} - \frac{50}{35}$

Need more help with fraction subtraction? See T19-20.

Combine the numerators: $= \frac{97}{35}$

Because this improper fraction is not among the answer choices, convert it to a mixed number: $\frac{97}{35} = 2\frac{27}{35}$.

2. **(A)** The line of best fit is a line that "fits" the data "best." It is a line that most closely approximates the relationship between the two variables. Begin by sketching a line that fits the data "best" (see dotted line). One method to find the equation of this line ($y = mx + b$) is to approximate the slope (m) and the y-intercept (b). From the graph, the y-intercept (where the line crosses the y-axis) is approximately -1. The slope is negative because one variable decreases as the other variable increases. This alone would be enough to determine that the answer must be $y = -x - 1$.



To find the approximate slope, choose two points that could be on the line of best fit. For example, the points (-5, 4) and (3, -4) were chosen here to approximate the slope. Substitute these coordinates into the slope formula with (-5, 4) as (x_1, y_1) and (3, -4) as (x_2, y_2).

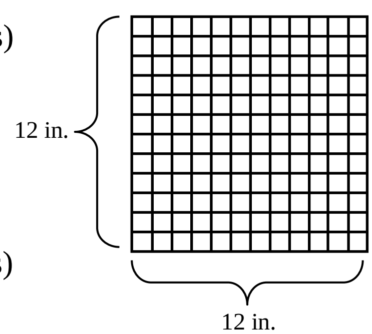
Slope Formula: $m = \dfrac{y_2 - y_1}{x_2 - x_1}$

Substitute coordinates: $m = \dfrac{-4 - 4}{3 - (-5)}$

Simplify: $m = \dfrac{-8}{8} = -1$

Since m = -1 and b = -1, the line of best fit is $y = -1x + (-1)$ or $y = -x - 1$.

3. **(D)** Draw a diagram of a square that measures 1 foot (12 inches) on each side. To find the area of the square (which is also a rectangle), use the area formula given on the Formula Sheet: $A = lw$. In this case, the length (l) and width (w) are both 12 inches.



$A = lw$

Substitute values: A = (12 inches)(12 inches)

Simplify: A = 144 square inches

Note that there are 144 squares (each representing one square inch) in the diagram.

Common Core Standard: 5.NBT.4
Mathematical Practices: *Attend to precision.*

1. Round 5481.06749 to the nearest thousandth.

   A 5481.067

   B 5481.0674

   C 5481.0675

   D 5481.068

Common Core Standard: 7.G.6
Mathematical Practices: *Make sense of problems and persevere in solving them.*

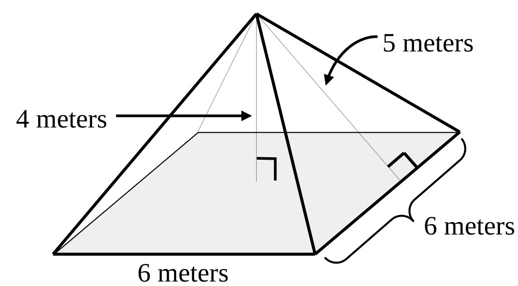
2. Find the surface area of the pyramid.

   A 48 m^2

   B 60 m^2

   C 84 m^2

   D 96 m^2



Common Core Standard: 6.EE.2.c
Mathematical Practices: *Attend to precision.*

3. Evaluate when $x = -2$: $-5x^3 + 6x^2 - 3x$

   A -22

   B 10

   C 12

   D 70

In this preview, the solution pages follow their corresponding problem pages.

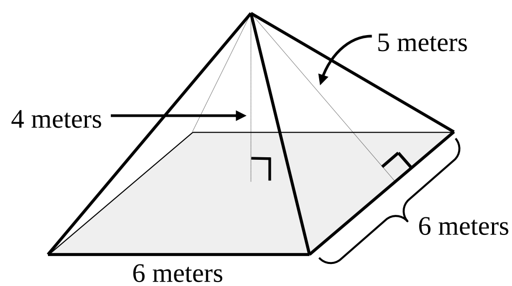
1. **(A)** Recall place value:

5	4	8	1	.	0	6	**7**	4	9
Thousands	Hundreds	Tens	Ones		Tenths	Hundredths	**Thousandths**	Ten Thousandths	Hundred Thousandths

The digit in the thousandths place in the number 5481.06749 is 7. To round, use the digit to the right of 7 (in this case, the ten thousandths place). If this digit had been at least 5, then 7 would round to 8. But this digit is less than 5 (the digit is 4), so 7 remains. 5481.06749 rounded to the nearest thousandth is 5481.067.

2. **(D)** Surface area is the sum of the areas of the surfaces which make up the pyramid: the square base and the four triangular faces which are congruent and therefore have the same area. The formula provided on the Formula Sheet for the surface area of a pyramid with a square base is:

$$SA = s^2 + 4\left(\tfrac{1}{2}\, s\,\ell\right) = s^2 + 2s\ell$$



The area of the square base is s^2 and the area of the 4 triangles is $4\left(\tfrac{1}{2} s\,\ell\right)$ where s is the length of the side of the square and ℓ is the slant height or height of the triangular face. Recall that the height of a triangle is perpendicular to its base. In this example, the length s of the side of the square is 6 meters and the slant height ℓ is 5 meters.

Need more help with fraction multiplication? See T14.

	$SA = s^2 + 4\left(\tfrac{1}{2}\, s\,\ell\right)$
Simplify:	$SA = s^2 + 2s\ell$
Substitute (s = 6 m, ℓ = 5 m):	$SA = (6\text{ m})^2 + 2(6\text{ m})(5\text{ m})$
Simplify:	$SA = 36\text{ m}^2 + 60\text{ m}^2$
	$SA = 96\text{ m}^2$

3. **(D)** Substitute the given value for x into the expression and simplify using the order of operations. Remember to use parentheses when substituting a negative value.

See Solution Page 1 for more information on order of operations.

	$-5x^3 + 6x^2 - 3x$	
Substitute (x = -2):	$-5(-2)^3 + 6(-2)^2 - 3(-2) =$	
Exponents:	$-5(-8) + 6(-2)^2 - 3(-2) =$	$(-2)^3 = (-2)(-2)(-2) = -8$
	$-5(-8) + 6(4) - 3(-2) =$	$(-2)^2 = (-2)(-2) = 4$
Multiply -5(-8) and 6(4):	$40 + 24 - 3(-2) =$	The sign refers to the term that it precedes.
Multiply -3(-2):	$40 + 24 + 6 =$	
Add:	70	

Need more help with integer operations? See T33-40.

NO CALCULATOR

Recommendation: Students should not use a calculator to solve the problems on this page.

Common Core Standard: 6.NS.7, 8.NS.1, 8.NS.2, 8.EE.3
Mathematical Practices: *Reason abstractly and quantitatively.*

1. Put the following numbers in order from least to greatest:

$$2.\overline{13},\ \sqrt{3},\ {}^{-13}\!/_{5},\ 1.69 \times 10^{-3},\ 6\%$$

A $\ {}^{-13}\!/_{5},\ 2.\overline{13},\ \sqrt{3},\ 6\%,\ 1.69 \times 10^{-3}$

B $\ {}^{-13}\!/_{5},\ 1.69 \times 10^{-3},\ 6\%,\ \sqrt{3},\ 2.\overline{13}$

C $\ 1.69 \times 10^{-3},\ {}^{-13}\!/_{5},\ 6\%,\ 2.\overline{13},\ \sqrt{3}$

D $\ 1.69 \times 10^{-3},\ {}^{-13}\!/_{5},\ 6\%,\ \sqrt{3},\ 2.\overline{13}$

Common Core Standard: 7.EE.2, F-BF.3
Mathematical Practices: *Reason abstractly and quantitatively.*

2. Let $y = \dfrac{x}{3}$. If x is doubled, what happens to y?

A y is doubled.

B y is divided by 2.

C y is multiplied by 6.

D y is tripled.

Common Core Standard: 7.SP.7.b
Mathematical Practices: *Reason abstractly and quantitatively.*

3. Jenny has a bag of lollipops leftover from Halloween. There are 6 cherry, 5 lemon, 2 grape, 3 orange and 4 lime. What is the probability that Jenny randomly chooses a cherry lollipop?

A ${}^{3}\!/_{10}$

B 30%

C 0.3

D All of the above

In this preview, the solution pages follow their corresponding problem pages.

1. **(B)** To order the numbers from least to greatest without using a calculator, begin by determining the smallest number in the list which is the only negative number, $^{-13}\!/_{5}$. Although 1.69×10^{-3} has a negative exponent, that does not change the sign of the number itself. The negative exponent will move the decimal point three place values to the left as opposed to the right (if the exponent was positive) as shown below:

$$1.69 \times 10^{-3} = 0.00169$$

The largest number is either $2.\overline{13}$ or $\sqrt{3}$. To estimate the value of $\sqrt{3}$, find a perfect square less than 3 and a perfect square greater than 3:

$$\sqrt{1} < \sqrt{3} < \sqrt{4}$$
$$1 < \sqrt{3} < 2$$

Because $\sqrt{3}$ is less than 2, $2.\overline{13}$ is the larger number. Only Choice B lists $^{-13}\!/_{5}$ as the smallest number and $2.\overline{13}$ (which is equal to 2.13131313….) as the largest number. The numbers in order from least to greatest are:

$$^{-13}\!/_{5},\ 1.69 \times 10^{-3},\ 6\%,\ \sqrt{3},\ 2.\overline{13}$$

2. **(A)** It is often simpler to choose a value for x and compare the original equation to the new equation in which x is doubled. Consider the example when $x = 12$ and then double it to let $x = 24$:

	$y = \frac{x}{3}$		$y = \frac{x}{3}$
Substitute ($x = 12$):	$y = \frac{12}{3}$	Substitute ($x = 24$):	$y = \frac{24}{3}$
Simplify:	$y = 4$	Simplify:	$y = 8$

Because 8 is twice the value of 4, y doubles when x is doubled.

It is also possible to determine the change algebraically. If one side of the equation is doubled (multiplied by 2), then the other side must also be multiplied by 2:

$$y = \frac{x}{3}$$

Multiply both sides by 2: $2y = \frac{2x}{3}$ (Again, y doubles when x is doubled.)

3. **(D)** Theoretically each lollipop is equally likely to be chosen. Find the total number of lollipops in the bag by adding the number of each flavor: $6 + 5 + 2 + 3 + 4 = 20$.

Probability is the $\dfrac{\text{number of favorable outcomes}}{\text{total number of possible outcomes}} = \dfrac{\text{6 cherry lollipops}}{\text{20 lollipops}} = \dfrac{6}{20} = \dfrac{3}{10}$

Note that $\frac{3}{10}$ could also be written as the decimal 0.3 (divide the numerator by the denominator if necessary) which is equal to 30% (multiply the decimal by 100). All three choices represent the same number. The correct choice is D, all of the above.

Need more help with converting fraction to percent? See T31.

Common Core Standard: 8.EE.7.b, A-REI.3
Mathematical Practices: *Reason abstractly and quantitatively.*

1. Solve for x: $-9(x - 4) = 6 - 2(x + 8)$

A $-58/7$

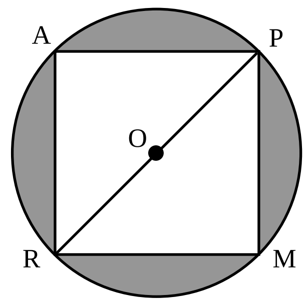
B $-12/13$

C $4/13$

D $46/7$

Common Core Standard: 7.G.4, 7.G.6, 8.G.7
Mathematical Practices: *Make sense of problems and persevere in solving them.*

2. Square PARM is inscribed in circle O. If the diameter of the circle is 24 mm, find the area of the shaded region.



A $(24\pi - 144)\text{ mm}^2$

B $(36\pi - 72)\text{ mm}^2$

C $(144\pi - 288)\text{ mm}^2$

D $(576\pi - 576)\text{ mm}^2$

Common Core Standard: 6.EE.3, A-SSE.3
Mathematical Practices: *Look for and make use of structure.*

3. Simplify: $(3x + 7)^2$

A $6x^2 + 14$

B $6x^2 + 20x + 14$

C $9x^2 + 49$

D $9x^2 + 42x + 49$

In this preview, the solution pages follow their corresponding problem pages.

1. **(D)** Solve for x as follows:

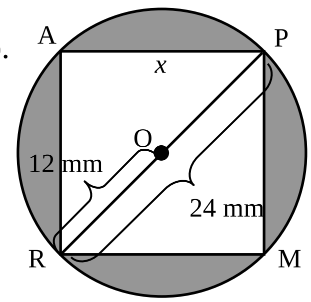
	$-9(x-4)=6-2(x+8)$
Distribute -9:	$-9x+36=6-2(x+8)$
Distribute -2:	$-9x+36=6-2x-16$
Combine 6 – 16:	$-9x+36=-10-2x$
Add $2x$ to both sides:	$-7x+36=-10$
Subtract 36 from both sides:	$-7x=-46$
Divide both sides by -7:	$x=\frac{46}{7}$

(Recall the order of operations: multiplication before subtraction. Also the sign refers to the term that it precedes.)

2. **(C)** The area of the shaded region can be found by taking the difference between the area of the outer region (the circle) and the area of the inner region (the square). If the diameter of the circle is 24 mm, the radius (r) is 12 mm. Using the Formula Sheet, find the area of the circle as follows:

$$A=\pi r^2=\pi(12)^2=\pi\bullet 144=144\pi \text{ mm}^2$$

To find the area of the square, determine the length of the side (x). (Recall that the sides of a square are congruent). Because a square has four right angles, ΔAPR is a right triangle. Use the Pythagorean Theorem to find the length of the side of the square.



	$a^2+b^2=c^2$
Substitute lengths:	$x^2+x^2=24^2$
Combine like terms:	$2x^2=24^2$
Simplify:	$2x^2=576$
Divide both sides by 2:	$x^2=288$
Take the square root of both sides:	$x=\sqrt{288}$

(In geometry, only the principal square root which is the positive root is needed.)

Simplify the square root: $\sqrt{288}=\sqrt{144\bullet 2}=\sqrt{12\bullet 12\bullet 2}=12\sqrt{2}$

To find the area of the square (which is also a rectangle), use the area formula given on the Formula Sheet: $A=lw$. In this case, the length (l) and width (w) are both $12\sqrt{2}$ mm.

Substitute values:	$A=(12\sqrt{2})(12\sqrt{2})$
Re-order if necessary:	$A=12\bullet 12\bullet\sqrt{2}\bullet\sqrt{2}$ (Commutative Property of Multiplication)
Simplify:	$A=144\bullet 2=288 \text{ mm}^2$

Area of the shaded region:	Area of Circle – Area of Square
Substitute values:	$(144\pi-288) \text{ mm}^2$

3. **(D)** To simplify this expression, recall that an exponent indicates how many times the base is used as a factor. In this case, the base is $3x+7$ which is used a factor (multiplied) twice. Rewrite $(3x+7)^2$ as $(3x+7)(3x+7)$. Multiply each term of the first binomial by each term of the second binomial. The process is shown below:

$$(3x+7)(3x+7)=$$

Multiply terms:	$\underbrace{3x\bullet 3x}_{\text{FIRST TWO TERMS}}+\underbrace{3x\bullet 7}_{\text{OUTER TERMS}}+\underbrace{7\bullet 3x}_{\text{INNER TERMS}}+\underbrace{7\bullet 7}_{\text{LAST TERMS}}=$
Simplify:	$9x^2+21x+21x+49=$
Combine like terms:	$9x^2+42x+49$

Percents

A percent is the number of parts per hundred. It is actually another way to represent a fraction or decimal.

Example #1: What is a percent?

n% means n parts out of 100 or $\frac{n}{100}$.

It may be necessary to convert a percent to a fraction or decimal. It is possible to convert the percent to a fraction first and then to a decimal *or* convert the percent to a decimal first and then to a fraction. Both methods are shown in the examples below.

Example #2: Convert 13% to a fraction and then to a decimal.

Percent to fraction: 13% means 13 parts out of 100 or the fraction $\frac{13}{100}$.

Fraction to decimal: Recall that the fraction bar is actually a division symbol.

$\frac{13}{100}$ means $13 \div 100 = 0.13$

(Dividing by 100 moves the decimal point two place values to the left.)

Example #3: Convert 28% to a fraction and then to a decimal.

Percent to fraction: 28% means 28 parts out of 100 or the fraction $\frac{28}{100}$.

Simplify by dividing by the GCF: $\frac{28}{100} \div \frac{4}{4} = \frac{7}{25}$

Fraction to decimal: Recall that the fraction bar is actually a division symbol.

$\frac{7}{25}$ means $7 \div 25 = 0.28$

If a calculator is not available, it is easier to convert the fraction to a decimal before simplifying the fraction:

$\frac{28}{100} = 28 \div 100 = 0.28$

(Dividing by 100 moves the decimal point two place values to the left.)

If the number is greater than 100%, then the corresponding fraction is greater than 1 which means that the numerator will be larger than the denominator. This improper fraction could be written as a mixed number. The corresponding decimal will also be greater than 1.

Example #4: Convert 115% to a fraction and then to a decimal.

Percent to fraction: 115% means 115 parts out of 100 or the fraction $\frac{115}{100}$.

Simplify by dividing by the GCF: $\frac{115}{100} \div \frac{5}{5} = \frac{23}{20}$ or $1\frac{23}{20}$

Fraction to decimal: Recall that the fraction bar is actually a division symbol.

$\frac{23}{20}$ means $23 \div 20 = 1.15$

If a calculator is not available, it is easier to convert the fraction to a decimal before simplifying the fraction:

$\frac{115}{100} = 115 \div 100 = 1.15$

(Dividing by 100 moves the decimal point two place values to the left.)

Example #5: Convert 1.2% to a fraction and then to a decimal.

Percent to fraction: 1.2% means 1.2 parts out of 100 or the fraction $\frac{1.2}{100}$.

Simplify this complex fraction by multiplying by a form of one to move the decimal point in the numerator, producing the whole number 12.

$$\frac{1.2}{100} \bullet \frac{10}{10} = \frac{12}{1000}$$

Continue simplifying by dividing by the GCF:

$$\frac{12}{1000} \div \frac{4}{4} = \frac{3}{250}$$

Fraction to decimal: Recall that the fraction bar is actually a division symbol.

$\frac{3}{250}$ means $3 \div 250 = 0.012$

If a calculator is not available, it is easier to convert the fraction to a decimal before simplifying the fraction:

$\frac{12}{1000} = 12 \div 1000 = 0.012$

(Dividing by 1000 moves the decimal point three place values to the left.)

Example #6: Convert 23% to a decimal and then to a fraction.

Percent to decimal: Move the decimal point two place values to the left. Although there is no decimal point shown in 23%, it is understood that the decimal point is after the 3.

$$23.\% = 0.23$$

Decimal to fraction: 0.23 is read as “twenty-three hundredths.” Using decimal place value (the place value will become the number in the denominator), write this decimal as a fraction $\frac{23}{100}$.

Example #7: Convert 8% to a decimal and then to a fraction.

Percent to decimal: Move the decimal point two place values to the left. Although there is no decimal point shown in 8%, it is understood that the decimal point is after the 8.

$$8.\% = 0.08$$

Decimal to fraction: 0.08 is read as “eight hundredths.” Using decimal place value (the place value will become the number in the denominator), write this decimal as a fraction $\frac{8}{100}$.

Simplify by dividing by the GCF: $\frac{8}{100} \div \frac{4}{4} = \frac{2}{25}$

Example #8: Convert 148% to a decimal and then to a fraction.

Percent to decimal: Move the decimal point two place values to the left. Although there is no decimal point shown in 148%, it is understood that the decimal point is after the 8.

$$148.\% = 1.48$$

Decimal to fraction: 1.48 is read as “one and forty-eight hundredths.” Using decimal place value (the place value will become the number in the denominator), write this decimal as a fraction $1\frac{48}{100}$ or $\frac{148}{100}$.

Simplify by dividing by the GCF: $\frac{148}{100} \div \frac{4}{4} = \frac{37}{25}$ or $1\frac{12}{25}$

Example #9: Convert 0.04% to a decimal and then to a fraction.

Percent to decimal: Move the decimal point two place values to the left, adding zeros as place holders when necessary:

$$0.04\% = 0.0004$$

Decimal to fraction: 0.0004 is read as "four ten-thousandths." Using decimal place value (the place value will become the number in the denominator), write this decimal as a fraction $\frac{4}{10{,}000}$.

Simplify by dividing by the GCF: $\frac{4}{10{,}000} \div \frac{4}{4} = \frac{1}{2500}$

It may also be necessary to convert a fraction or decimal to a percent. Changing a decimal to a percent involves moving the decimal point two place values to the right (the hundredths place) because percent is the number of parts per hundred.

Example #10: Convert the decimal 0.456 to a percent.

Move the decimal point two place values to the right: 0.456 = 45.6%

Example #11: Convert the decimal 0.0162 to a percent.

Move the decimal point two place values to the right: 0.0162 = 01.62% =1.62%

It is always possible to convert a fraction to a decimal and then change the decimal to a percent by moving the decimal point two place values to the right as shown in the previous two examples. However if the fraction has a denominator of 100, it is possible to convert directly to a percent. At times, it may be faster to produce a fraction equivalent to the given fraction with a denominator of 100 in order to convert to a percent. The following examples show both methods.

Example #12: Convert the fraction $\frac{6}{100}$ to a percent.

Fraction to decimal: Recall that the fraction bar is actually a division symbol.

$\frac{6}{100}$ means 6 ÷ 100 = 0.06

Decimal to percent: Move the decimal point two place values to the right.

$$0.06 = 06.\% = 6\%$$

Alternative method: $\frac{6}{100} = 6\%$

(Recall that a percent is the number of parts per hundred.)

Example #13: Convert the fraction $\frac{1}{5}$ to a percent.

Fraction to decimal: Recall that the fraction bar is actually a division symbol.

$\frac{1}{5}$ means $1 \div 5 = 0.2$

Decimal to percent: Move the decimal point two place values to the right, adding zeros as place holders when necessary.

$$0.2 = 20.\%$$

Alternative method: $\frac{1}{5} \cdot \frac{20}{20} = \frac{20}{100} = 20\%$

(Recall that a percent is the number of parts per hundred.)

Example #14: Convert the fraction $\frac{3}{8}$ to a percent.

Fraction to decimal: Recall that the fraction bar is actually a division symbol.

$\frac{3}{8}$ means $3 \div 8 = 0.375$

Decimal to percent: Move the decimal point two place values to the right.

$$0.375 = 37.5\%$$

In this case, the alternative method would be difficult and should not be used.

Another option is to use a proportion to change a fraction to a percent. Example 14 is reworked below using this method:

$$\frac{3}{8} = \frac{x}{100}$$

Multiply both sides by 8 and 100: $300 = 8x$
Divide both sides by 8: $37.5 = x$

So $\frac{3}{8} = 37.5\%$.

Quick Reference Answer Key

Problems are referenced by page number followed by problem number (e.g. 4.3 represents Page 4 Problem 3).

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1.2 C
1.3 B

2.1 B
2.2 C
2.3 C

3.1 C
3.2 C
3.3 C

4.1 B
4.2 B
4.3 B

5.1 B
5.2 B
5.3 B

6.1 B
6.2 D
6.3 A

7.1 A
7.2 D
7.3 D

8.1 D
8.2 C
8.3 B

9.1 B
9.2 C
9.3 C

10.1 D
10.2 A
10.3 C

11.1 B
11.2 B
11.3 C

12.1 D
12.2 C
12.3 B

13.1 B
13.2 D
13.3 A

14.1 B
14.2 A
14.3 D

15.1 A
15.2 A
15.3 B

16.1 B
16.2 B
16.3 C

17.1 C
17.2 C
17.3 C

18.1 A
18.2 A
18.3 D

19.1 D
19.2 B
19.3 C

20.1 C
20.2 A
20.3 C

21.1 D
21.2 B
21.3 A

22.1 D
22.2 C
22.3 A

23.1 C
23.2 A
23.3 C

24.1 D
24.2 B
24.3 B

25.1 B
25.2 B
25.3 D

26.1 A
26.2 D
26.3 D

27.1 B
27.2 A
27.3 C

28.1 B
28.2 C
28.3 B

29.1 A
29.2 B
29.3 A

30.1 C
30.2 C
30.3 C