Algebra 2

An Incremental Development

THIRD EDITION

SAXON

Contents

LESSON A *Geometry Review • Angles • Review of Absolute Value • Properties and Definitions*

A.A geometry review

Some fundamental mathematical terms are impossible to define exactly. We call these terms **primitive terms** or **undefined terms.** We define these terms as best we can and then use them to define other terms. The words **point, curve, line,** and **plane** are primitive terms.

A **point** is a location. When we put a dot on a piece of paper to mark a location, the dot is not the point, because a mathematical point has no size and the dot does have size. We say that the dot is the **graph** of the mathematical point and marks the location of the point. A **curve** is an unbroken connection of points. Since points have no size, they cannot really be connected. Thus, we prefer to say that a curve defines the path traveled by a moving point. We can use a pencil to graph a curve. These figures are curves.

A mathematical **line** is a straight curve that has no ends. **Only one mathematical line can be drawn that passes through two designated points.** Since a line defines the path of a moving point that has no width, a line has no width. The pencil line that we draw marks the location of the mathematical line. When we use a pencil to draw the graph of a mathematical line, we often put arrowheads on the ends of the pencil line to emphasize that the mathematical line has no ends.

We can name a line by naming any two points on the line in any order. The line above can be called line AB, line BA, line AC, line CA, line BC, or line CB. Instead of writing the word *line*, we can put a bar with two arrowheads above the letters, as we show here.

$$\overleftrightarrow{AB} \quad \overleftrightarrow{BA} \quad \overleftrightarrow{AC} \quad \overleftrightarrow{CA} \quad \overleftrightarrow{BC} \quad \overleftrightarrow{CB}$$

These notations are read as "line AB," "line BA," etc. We remember that a part of a line is called a **line segment** or just a **segment.** A segment has two endpoints. A segment can be named by naming the two endpoints in any order. The following segment can be called segment AB or segment BA.

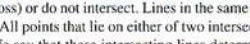
Instead of writing the word *segment*, we can draw a bar with no arrowheads above the letters. Segment AB and segment BA can be written as

$$\overline{AB} \quad \text{and} \quad \overline{BA}$$

If we write the letters without using the bar, we are designating the length of the segment. If segment AB has a length of 2 centimeters, we could write either

$$AB = 2 \text{ cm} \quad \text{or} \quad BA = 2 \text{ cm}$$

A **ray** is sometimes called a **half line.** A ray has one endpoint, the beginning point, called the **origin.** The ray shown here begins at point A, goes through points B and C, and continues without end.

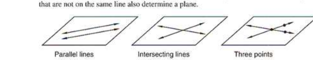


When we name a ray, we must name the origin first and then name any other point on the ray. We can name a ray by using a line segment with one arrowhead. The ray shown above can be named by writing either

$$\overrightarrow{AB} \quad \text{or} \quad \overrightarrow{AC}$$

These notations are read by saying "ray AB" and "ray AC."

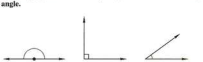
A **plane** is a flat surface that has no boundaries and no thickness. Two lines in the same plane either **intersect** (cross) or do not intersect. Lines in the same plane that do not intersect are called **parallel lines.** All points that lie on either of two intersecting lines are in the plane that contains the lines. We say that these intersecting lines determine the plane. Since three points that are not on the same line determine two intersecting lines, we see that three points that are not on the same line also determine a plane.



Parallel lines   Intersecting lines   Three points

A.B angles

The word **angle** comes from the Latin word *angulum,* meaning "corner." An angle is formed by two rays that have a common endpoint. If the rays point in opposite directions, we say that the angle formed is a **straight angle.** If the rays make a square corner, we say that the rays are **perpendicular** and that the angle formed is a **right angle.** We often use a small square, as in the following figure, to designate a right angle. If the angle is smaller than a right angle, it is an **acute angle.** An angle greater than a right angle but less than a straight angle is called an **obtuse angle.** An angle greater than a straight angle but less than two straight angles is called a **reflex angle.**

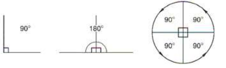


Straight angle   Right angle   Acute angle

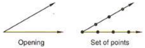
Obtuse angle   Reflex angle

If a right angle is divided into 90 parts, we say that each part has a measure of 1 degree. Thus, a right angle is a **90-degree angle.** Two right angles make a straight angle, so a

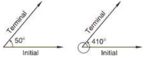
straight angle is a 180-degree angle. Four right angles form a **360-degree angle.** Thus, the measure of a circle is 360 degrees. We use a small raised circle to denote degrees. Thus, we can write 90 degrees, 180 degrees, and 360 degrees as 90°, 180°, and 360°.



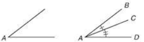
European authors tend to define an angle to be the **opening** between two rays. Authors of U.S. geometry books tend to define the angle to be the **set of points** determined by the two rays.



Authors of trigonometry books prefer to define an angle to be a **rotation** of a ray about its endpoint from an **initial position** to a final position called the **terminal position.** We see that the rotation definition permits us to distinguish between a 50° angle and a 410° angle even though the initial and terminal positions are the same.

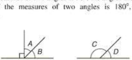


Some angles can be named by using a single letter preceded by the symbol $\angle$. The notation $\angle A$ is read as "angle A." Some angles require that we use three letters to name the angle. The notation $\angle BAD$ is read as "angle BAD." When we use three letters, the middle letter names the **vertex** of the angle, which is the point where the two rays of the angle intersect. The other two letters name a point on one ray and a point on the other ray.

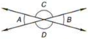


The angle on the left is $\angle A$. The figure on the right has three angles. The big angle is $\angle BAD$. Angle BAC and angle CAD are called **adjacent angles** because they have the same vertex, share a common side, and do not overlap (i.e., do not have any common interior points).

If the sum of the measures of two angles is 90°, the angles are called **complementary angles.** If the sum of the measures of two angles is 180°, the angles are called **supplementary angles.**



In the figures in this book, lines that appear to be straight are straight. Two intersecting lines (all lines are straight lines) form four angles. The angles that are opposite each other are called **vertical angles.** Vertical angles are equal angles.



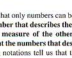
In this figure, angle A has the same measure as angle B, and angle C has the same measure as angle D.

It is important to remember that only numbers can be equal. **If we say that two angles are equal, we mean that the number that describes the measure of one angle is equal to the number that describes the measure of the other angle. If we say that two line segments are equal, we mean that the numbers that describe the lengths of the segments are equal.** Both of the following notations tell us that the measure of angle A equals the measure of angle B.

$$\angle A = \angle B \qquad m\angle A = m\angle B$$

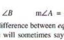
Because excessive attention to the difference between *equal* and *equal measure* tends to be counterproductive, in this book we will sometimes say that angles are equal or that line segments are equal, because this phrasing is easily understood. **However, we must remember that when we use the words *equal angles* or *equal segments,* we are describing angles whose measures are equal and segments whose lengths are equal.**

example A.1 Find x and y.



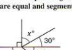
solution The 30° angle and angle x form a right angle, so x equals **60.** Thus, angle x and the 30° angle are **complementary** angles. The 40° angle and angle y form a straight angle. Straight angles are 180° angles, so y equals **140.** Thus, angle y and the 40° angle are **supplementary** angles.

example A.2 Find x, y, and p.



solution Angle y and the 50° angle form a 180° angle. Thus, y equals **130.** Because vertical angles are equal angles, x equals **50** and p equals **130.**

example A.3 Find x, y, and p.



solution This problem allows us to use the fact that if two angles form a straight angle, the sum of their measures is 180°. We see that angle $2y$ and 110° form a straight angle. Also, $5x$ must equal 110° because vertical angles are equal.

Straight Angle	Vertical Angle
$2y + 110 = 180$	$5x = 110$
$2y = 70$	$\boldsymbol{x = 22}$
$\boldsymbol{y = 35}$	

Since y is 35, $2y$ is 70. Thus, $\boldsymbol{p = 70}$ because vertical angles are equal.

Homeschool Testing Book

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Test 1

1. (A) $m + 81 = 180$
$m = \mathbf{99}$

Since vertical angles are equal:
$n = \mathbf{99}$

$3p = 81$
$p = \mathbf{27}$

2. (A) $3x + 120 = 180$
$3x = 60$
$x = \mathbf{20}$

Since vertical angles are equal:
$6y = 120$
$y = \mathbf{20}$

$4z = 60$
$z = \mathbf{15}$

3. (A) $x + 37^\circ = 90^\circ$
$x = \mathbf{53^\circ}$

4. (B) $P = \frac{1}{2}(2)(\pi)(3) + \frac{1}{2}(2)(\pi)(4) + 48$
$= 3\pi + 4\pi + 48$
$= 7\pi + 48 = \mathbf{69.98\ in.}$

5. (B) $A = \frac{60}{360} \cdot \pi(8)^2$
$= \frac{60}{360} \cdot 64\pi = \mathbf{33.49\ in.^2}$

6. (B) $A_{\text{Base}} = \frac{1}{2}\pi(3)^2 + (18)(8)$
$= \frac{9}{2}\pi + 144 \approx 158.13\ \text{m}^2$

$V = \frac{1}{3}A_{\text{Base}} \times H$
$\approx \frac{1}{3}(158.13)(4) \approx \mathbf{210.84\ m^3}$

7. (B) $A = \frac{1}{2}(12)(8) - \frac{1}{2}(5)(2) - \frac{1}{2}(10)(3) - (2)(3)$
$= 48 - 5 - 15 - 6 = \mathbf{22\ ft^2}$

8. (B) $A = 12(5) - \pi(2)^2 = 60 - 4\pi \approx \mathbf{47.44\ m^2}$

9. (B) $A_{\text{Base}} = \pi(5)^2 = 25\pi\ \text{in.}^2$
$V = A_{\text{Base}} \times H$
$750\pi = (25\pi)H$
$H = \mathbf{30\ in.}$

10. (1) Since angles opposite equal sides are equal angles, $a = \mathbf{42}$.
$b + 42 + 42 = 180$
$b = \mathbf{96}$

11. (1) $4 \times \overline{SF} = 7$
$\overline{SF} = \frac{7}{4}$
$3 \times \overline{SF} = y$
$3\left(\frac{7}{4}\right) = y$
$y = \mathbf{\frac{21}{4}}$

12. (B) $V = \frac{2}{3}A_{\text{Base}} \times \text{height}$
$= \frac{2}{3}[\pi(8)^2](16)$
$= \frac{2}{3}(1024\pi) \approx \mathbf{2143.57\ cm^3}$

$S.A. = 4\pi r^2 = 4\pi(8)^2 \approx \mathbf{803.84\ cm^2}$

13. (2) $\frac{(xy^2)^0 x^2 y}{x(y^{-3})^3} = \frac{x^2 y}{xy^{-9}} = \mathbf{xy^{10}}$

14. (2) $\frac{(x^3y^{-1})^{-2}z^{-2}}{(y^3zy^{-2})^5} = \frac{x^{-6}y^2z^{-2}}{y^{15}z^5y^{-10}} = \mathbf{x^{-6}y^{-3}z^{-7}}$

15. (2) $\frac{x^3y^2z^{-2}}{(xw^0)^{-2}z^{-1}x^2w^3} = \frac{x^3y^2z^{-2}}{x^{-2}z^{-1}x^2w^3}$
$= \mathbf{x^3y^2z^{-1}w^{-3}}$

16. (2) $-3^{-5} = -\frac{1}{3^5} = \mathbf{-\frac{1}{243}}$

17. (2) $\frac{1}{-3^{-3}} = -3^3 = \mathbf{-27}$

18. (A) $-4^3 - [-5^0 - (3 - 5) - 4]$
$= -64 - [-1 + 2 - 4] = -64 - [-3] = \mathbf{-61}$

19. (A) $-|-3 - 5| - (-3)^2 - 3^2 = -|-8| - 9 - 9$
$= -8 - 9 - 9 = \mathbf{-26}$

20. (A) $-3[-6^0 - 2(6 - 8) - 2^3]$
$= -3[-1 - 2(-2) - 8]$
$= -3[-1 + 4 - 8] = -3[-5] = \mathbf{15}$

15. (4) $4\frac{2}{3}x - 2\frac{1}{5} = 3\frac{1}{6}$

$$\frac{14}{3}x = \frac{19}{6} + \frac{11}{5}$$

$$\frac{14}{3}x = \frac{95}{30} + \frac{66}{30}$$

$$\frac{14}{3}x = \frac{161}{30}$$

$$x = \frac{161}{30} \cdot \frac{3}{14} = \frac{23}{20} = \mathbf{1\frac{3}{20}}$$

16. (4) $-2 - 2^3 - 2(x - 2) = 2[(x - 2)2 - 2]$

$$-2 - 8 - 2x + 4 = 2[2x - 6]$$

$$-2x - 6 = 4x - 12$$

$$6x = 6$$

$$x = \mathbf{1}$$

17. (4) $\frac{ab}{m}\left(\frac{-2m^{-2}}{ba} + \frac{3m}{a^{-1}b}\right) = \frac{-2abm^{-2}}{mba} + \frac{3abm}{ma^{-1}b}$

$= \mathbf{-2m^{-3} + 3a^2}$

18. (5) $x = 4(90 - x)$

$$x = 360 - 4x$$

$$5x = 360$$

$$x = \mathbf{72°}$$

19. (6) $N \quad N + 2 \quad N + 4$

$$3(N + N + 4) = 4(N + 2) + 18$$

$$6N + 12 = 4N + 26$$

$$2N = 14$$

$$N = 7$$

The desired integers are **7, 9,** and **11.**

20. (6) $1 - 0.382 = 0.618$

If 0.382 are totally loyal, then 0.618 are not totally loyal.

$WD \times of = is$

$0.618(8000) = NL$

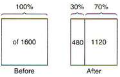
$NL =$ **4944 employees**

TEST 3

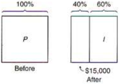
1. (7) $\frac{P}{100} \times of = is \longrightarrow \frac{30}{100} \times WN = 480$

$$WN = 480 \cdot \frac{100}{30} = \mathbf{1600}$$

Since one part of 1600 is 480 for 30%, the other part must be 1120 for 70%.



2. (9)



$$\frac{P}{100} \times of = is \longrightarrow \frac{40}{100} \times P = \$15{,}000$$

$$P = \$15{,}000 \cdot \frac{100}{40} = \mathbf{\$37{,}500}$$

3. (6) $N \quad N + 2 \quad N + 4$

$$3N = 2(N + 2 + N + 4) - 26$$

$$3N = 4N - 14$$

$$N = 14$$

The desired integers are **14, 16,** and **18.**

4. (5) $F \times of = is$

$$2\frac{3}{4} \times R = 3300$$

$$R = 3300 \cdot \frac{4}{11} = \textbf{1200 walk randomly}$$

5. (1) Since angles opposite equal sides are equal angles, $b = \mathbf{75}$.

$$a + b + 75 = 180$$

$$a = 180 - 75 - 75 = \mathbf{30}$$

$$b + \angle XYZ = 180$$

$$\angle XYZ = 180 - 75 = 105$$

$$c + 35 + 105 = 180$$

$$c = 180 - 105 - 35 = \mathbf{40}$$

6. (7) Since lines are parallel:

$$(4x + 7) + (3x - 16) = 180$$

$$7x - 9 = 180$$

$$7x = 189$$

$$x = \mathbf{27}$$

Test 4

1. (9) $\frac{P}{100} \times of = is$

$$\frac{340}{100} \times B = 68{,}000$$

$$B = 68{,}000 \cdot \frac{100}{340} = \mathbf{20{,}000\ flowers}$$

2. (5) $-3(2N + 6) = 3(-N) + 54$

$$-6N - 18 = -3N + 54$$
$$-3N = 72$$
$$N = \mathbf{-24}$$

3. (6) $N \quad N + 2 \quad N + 4$

$$6N = 4(N + 2 + N + 4) - 16$$
$$6N = 8N + 8$$
$$2N = -8$$
$$N = -4$$

The desired integers are **−4, −2,** and **0.**

4. (11) $c = \frac{1}{2}(130) = \mathbf{65}$

$$(3d - 7) + (4d + 13) = 360 - 130$$
$$7d + 6 = 230$$
$$7d = 224$$
$$d = \mathbf{32}$$

5. (1) $(180 - a) + 70 + (180 - 150) = 180$

$$-a + 180 + 70 + 30 = 180$$
$$a = \mathbf{100}$$

6. (13) $15^2 = H^2 + 10^2$

$$225 = H^2 + 100$$
$$125 = H^2$$
$$5\sqrt{5} = H$$
$$A = \frac{B \times H}{2} = \frac{(20 \times 5\sqrt{5})}{2} = \mathbf{50\sqrt{5}\ cm^2}$$

7. (12) (a) Every point is 2 units below the x-axis.

$$\mathbf{y = -2}$$

(b) The y-intercept is +1. The slope is negative and the rise over the run for any triangle drawn is $-\frac{4}{3}$.

$$\mathbf{y = -\frac{4}{3}x + 1}$$

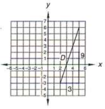
8. (11) $3 + \frac{r}{3t^2} = \frac{9t^2}{3t^2} + \frac{r}{3t^2} = \mathbf{\frac{9t^2 + r}{3t^2}}$

9. (11) $\frac{a}{py} + y + \frac{a^2}{p^2} = \frac{ap}{p^2y} + \frac{p^2y^2}{p^2y} + \frac{a^2y}{p^2y}$

$$= \mathbf{\frac{ap + p^2y^2 + a^2y}{p^2y}}$$

10. (10) $D^2 = 3^2 + 9^2$

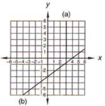
$$D^2 = 9 + 81$$
$$D^2 = 90$$
$$D = \sqrt{90}$$
$$D = \mathbf{3\sqrt{10}}$$



11. (8) (a) $x = 3$

(b) $3x - 4y = 12$

$$-4y = -3x + 12$$
$$y = \frac{3}{4}x - 3$$



12. (6) $0.3x - 0.3 - 0.03 = 0.33$

$$30x - 30 - 3 = 33$$
$$30x = 66$$
$$x = \mathbf{2.2}$$

13. (4) $-2^0(m^0 - 2) - 3(m - 3) = -2(m + 3^0)$

$$-1 + 2 - 3m + 9 = -2m - 2$$
$$-3m + 10 = -2m - 2$$
$$m = \mathbf{12}$$

$$\frac{P}{100} \times of = is \longrightarrow \frac{80}{100} \times AS = 6000$$

$$AS = 6000 \cdot \frac{100}{80} = 7500$$

$7500 - 6000 =$ **1500 spectators**

4. (15) (a) $2x + y = 16$

(b) $3x - 3y = 15$

$$\begin{aligned} 3(a)\ & 6x + 3y = 48 \\ (b)\ & \underline{3x - 3y = 15} \\ & 9x \quad\;\; = 63 \\ & \qquad x = 7 \end{aligned}$$

(a) $2(7) + y = 16$

$y = 2$

(7, 2)

5. (11) $\dfrac{a}{c^2} - a - \dfrac{2c}{3a^2} = \dfrac{3a^3}{3a^2c^2} - \dfrac{3a^3c^2}{3a^2c^2} - \dfrac{2c^3}{3a^2c^2}$

$$= \mathbf{\frac{3a^3 - 3a^3c^2 - 2c^3}{3a^2c^2}}$$

6. (10) $c^2 = a^2 + b^2$

$14^2 = d^2 + 5^2$

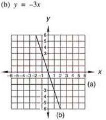
$196 = d^2 + 25$

$171 = d^2$

$d = \sqrt{171} = \mathbf{3\sqrt{19}}$

7. (8) (a) $y = -2$

(b) $y = -3x$



8. (14) $y = -\dfrac{2}{3}x + b$

$-3 = -\dfrac{2}{3}(4) + b$

$-\dfrac{9}{3} = -\dfrac{8}{3} + b$

$-\dfrac{1}{3} = b$

Since $m = -\dfrac{2}{3}$ and $b = -\dfrac{1}{3}$, $\mathbf{y = -\frac{2}{3}x - \frac{1}{3}}$.

9. (17) $a + 65 + 90 = 180$

$a = \mathbf{25}$

Since vertical angles are equal angles:

(a) $5x - 10y = 90$

(b) $-6x - 7y = 25$

$$\begin{aligned} 6(a)\ & 30x - 60y = 540 \\ 5(b)\ & \underline{-30x - 35y = 125} \\ & \qquad -95y = 665 \\ & \qquad\quad y = \mathbf{-7} \end{aligned}$$

(a) $5x - 10(-7) = 90$

$5x = 20$

$x = \mathbf{4}$

10. (8) $A = \dfrac{135}{360} \cdot \pi(10)^2$

$= \dfrac{135}{360} \cdot 100\pi \approx \mathbf{117.75\ cm^2}$

11. (4) $\dfrac{mn^0}{-n^2n^{-2}}\left(\dfrac{m}{n^3} - \dfrac{2m^3n^2}{mn^3}\right)$

$= \dfrac{mn^0m}{-n^2n^{-2}n^3} - \dfrac{mn^0\,2m^3n^2}{-n^2n^{-2}mn^3}$

$= -\dfrac{m^2}{n^3} + \dfrac{2m^4n^2}{mn^3} = \mathbf{-\frac{m^2}{n^3} + \frac{2m^3}{n}}$

12. (17) (a) $R_AT_A + R_BT_B = 300$

(b) $R_A = 60$

(c) $R_B = 12$

(d) $T_B = T_A + 7$

Substitute (b), (c), and (d) into (a) to get:

$60T_A + 12(T_A + 7) = 300$

$60T_A + 12T_A + 84 = 300$

$72T_A = 216$

$T_A = \mathbf{3}$

(d) $T_B = 3 + 7 = \mathbf{10}$

13. (16) $(3x - 2)(4x^2 - 7x - 5)$

$= 12x^3 - 21x^2 - 15x - 8x^2 + 14x + 10$

$= \mathbf{12x^3 - 29x^2 - x + 10}$

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SAXON™
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Answer Key

Algebra 2

An Incremental Development

THIRD EDITION

SAXON

Answers

problem set A

1. 115 **2.** 50 **3.** $x = 91$; $y = 89$; $p = 91$ **4.** $x = 40$; $y = 25$; $z = 80$ **5.** 140° **6.** 50° **7.** 0 **8.** –5 **9.** 0 **10.** –11 **11.** –10 **12.** –21 **13.** 5 **14.** –30 **15.** 4 **16.** –13 **17.** –16 **18.** –45 **19.** –66 **20.** –12 **21.** 0 **22.** –13 **23.** 35 **24.** –24 **25.** 11 **26.** $-\frac{5}{6}$ **27.** –10 **28.** $\frac{13}{7}$ **29.** 192 **30.** –98

problem set B

1. 13.76 m^2 **2.** 21 m^2 **3.** 136.96 cm^2 **4.** 20.28 m **5.** 8.72 m^2 **6.** 40 cm^3 **7.** 18.28 m^2; 146.24 m^3 **8.** 904.32 cm^3; 452.16 cm^2 **9.** 62.8 cm^2 **10.** 32.56 yd **11.** $x = 35$; $y = 110$; $z = 110$ **12.** 10 **13.** 20 **14.** 80° **15.** 120° **16.** –18 **17.** –4 **18.** –15 **19.** 23 **20.** –13 **21.** 26 **22.** –23 **23.** –16 **24.** –7 **25.** –11 **26.** –1 **27.** 6 **28.** $-\frac{3}{7}$ **29.** 0 **30.** 19

practice

a. $m\angle C = 35°$; $m\angle B = 110°$ **b.** $x = 35$; $y = 105$ **c.** $A = 50$; $B = 65$; $C = 50$ **d.** $\frac{8}{3}$

problem set 1

1. $x = 45$; $y = 90$ **2.** $x = 55$; $y = 70$ **3.** $A = 70$; $B = 110$; $C = 55$ **4.** $\frac{9}{2}$ **5.** 17.49 cm^2 **6.** 77.5 cm^2 **7.** 60.56 ft **8.** $V_{Cylinder} = 401.92$ ft^3; $V_{Sphere} = 267.95$ ft^3 **9.** $x = 30$; $y = 30$; $p = 150$ **10.** $x = 6$; $y = 30$; $p = 120$ **11.** 73° **12.** 102.97 m^3 **13.** $16r^2$ **14.** –15 **15.** –100 **16.** 52 **17.** –35 **18.** 36 **19.** 87 **20.** –17 **21.** 46 **22.** –34 **23.** –87 **24.** 6 **25.** –69 **26.** –12 **27.** $-\frac{8}{13}$ **28.** –214 **29.** –15 **30.** 216

practice

a. $-\frac{1}{16}$ **b.** $-\frac{1}{36}$ **c.** $x^{-1}y^4$ **d.** 14π cm

problem set 2

1. $\frac{9}{2}$ **2.** $x = 38$; $y = 104$ **3.** 178.99 m^3 **4.** $A = 20$; $B = 50$; $C = 40$ **5.** $A = 120$; $B = 30$; $C = 40$ **6.** $s = 4$ cm; $r = 1$ cm; $A = 3.14$ cm^2 **7.** 10 cm **8.** 8.76 m^3 **9.** x^6y^{-12} **10.** m^9p^{-3} **11.** $x^{-1}y^7$ **12.** ab^6 **13.** $\frac{m^5y^3}{x^2}$ **14.** $\frac{1}{c^7d^6}$ **15.** mn^4 **16.** $\frac{x^{10}}{z^5}$ **17.** $\frac{c^3}{b^6}$ **18.** $b^{-3}c^{-3}$ **19.** $\frac{x^{-2}}{c^{-3}}$ **20.** $\frac{1}{x^{-2}t^{-5}y^{-1}}$ **21.** $\frac{x^{-3}y^{-12}}{y^{-1}}$ **22.** $\frac{-1}{x^{-3}y^{-6}}$ **23.** $-\frac{1}{9}$ **24.** –8 **25.** –5 **26.** –8 **27.** –38 **28.** –12 **29.** –27 **30.** –9

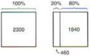
practice

a. 21 **b.** –9 **c.** $\frac{a^3m}{x} - \frac{3x}{a^2m}$

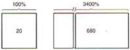
problem set 3

1. $x = \frac{15}{2}$; $y = 33$; $z = 9$ **2.** 25.12 m **3.** $A = 40$; $B = 100$ **4.** 110.28 cm^3 **5.** 54 cm **6.** –26 **7.** –23 **8.** 72 **9.** 895 **10.** –24 **11.** 2677 **12.** 1 **13.** $5p^4x^4m^5 - \frac{2p^2x^4}{m^3}$ **14.** $\frac{m^4x^5}{k^3} - \frac{3m^7}{xk^3}$ **15.** $x^5y^4 + 4xy$ **16.** $2ym^2 - xy^2m$ **17.** $x^8y^{-8}p^6$ **18.** $m^4x^5y^{10}p^2$ **19.** $x^{-7}m^{-7}p^2$ **20.** $p^2x^{-10}k^3$ **21.** x^3 **22.** $x^{-8}y^{16}p^{-2}$ **23.** $x^{-2}y^{12}$ **24.** $7\frac{8}{9}$ **25.** –1 **26.** –15 **27.** –1 **28.** 18 **29.** 100 **30.** –12

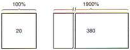
3. 2300



4. 3400%

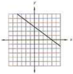


5. 20



6. −7, −5, −3 **7.** 2, 4, 6 **8.** 5 **9.** 15 **10.** 20 **11.** $m\angle a = 15°$; $m\angle b = 45°$; $m\angle c = 90°$; $m\angle d = 30°$ **12.** 180° **13.** $-\frac{1}{18}$ **14.** −4.88 **15.** $-\frac{47}{100}$ **16.** $-\frac{11}{7}$ **17.** $2 - 6x^2yp^{-1}$ **18.** $8 - 12x^{-1}y^2k^{-2}$ **19.** $2x^2y^{-10}$ **20.** $4x^{-6}y^9$ **21.** $2x^3yp^{-1}$ **22.** $-6xp^2 + 3p^2$ **23.** $-\frac{5}{12}$ **24.** $-\frac{1}{16}$ **25.** 16 **26.** $2\frac{1}{4}$ **27.** −50 **28.** 7 **29.** 38 **30.** −4

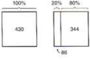
practice



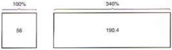
problem set 8

1. 2300 knights **2.** 18, 20, 22, 24 **3.** −13 **4.** 960 warriors **5.** 7, 9, 11

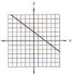
6. 430



7. 190.4

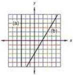


8. 61° **9.**



10. 19 **11.** $r = BD = AC = 5$ m **12.** 25 **13.** $x = 20$; $y = 105$ **14.** 9 **15.** $\frac{87}{35}$ **16.** $\frac{3}{2}$ **17.** $\frac{151}{56}$ **18.** $-3 - 4x^{-1}y^3p^{-3}$ **19.** $3x - 5p^2xy$ **20.** $2x^{-4}$ **21.** $20x^{-12}y^{-8}$ **22.** $5x^2y^{-1}$ **23.** $4xy^{-3} - 7xy$ **24.** $-\frac{3}{32}$ **25.** $\frac{1}{25}$ **26.** $\frac{2}{9}$ **27.** 24 **28.** 2 **29.** $-1\frac{1}{2}$ **30.** −2

14. $x = \frac{21}{5}$; $y = \frac{28}{5}$; $z = 6$ 15. $\sqrt{106}$ 16.



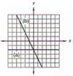
17. (a) $y = 2$ (b) $y = 2x$
18. $y = \frac{9}{5}x + \frac{2}{5}$ 19. $y = \frac{2}{7}x - \frac{29}{7}$
20. $x = 20$; $y = \frac{35}{9}$; $k = 115$
21. $A = 50$; $B = 130$; $C = D = 25$; Area $\approx$ 3.93 cm^2 22. $\frac{23}{39}$
23. -100 24. $-\frac{1}{2}$ 25. $-3x + 9px^{-1}y^3$
26. $x^{-1}y^4$ 27. $3x^2ay^{-1}$ 28. $-\frac{35}{108}$
29. 1 30. -16

practice

a. $8\sqrt{10} - 6\sqrt{35}$ b. 6 c. $y = \frac{1}{3}x + 2$

problem set 20

1. 560 kg 2. $P = 40$ performers; $N_V = 12$ virtuosos
3. $N_W = 10$ worthless ones; $N_E = 13$ expensive ones 4. 360 tons 5. $-4, -2, 0, 2$
6. (4, 16) 7. $-2x^2 - 2x - 3 - \frac{1}{x-1}$ 8. $T_B = 8$; $T_G = 5$ 9. $72 - 50\sqrt{3}$
10. $24 - 12\sqrt{2}$ 11. $50 - 75\sqrt{2}$ 12. $\frac{m^2 + 5x - mx^2}{ax^2}$
13. $\frac{2a^5 - 2a^5x^2 - 3x^3}{2a^5x^2}$ 14. $3\sqrt{7}$ ft^2 15. $z = \frac{24}{5}$; $A = \frac{28}{5}$ 16.



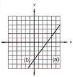
17. (a) $y = 1$ (b) $y = -x$ 18. $y = \frac{1}{3}x - \frac{5}{3}$
19. $y = -\frac{1}{12}x + \frac{31}{6}$
20. $A = 40$; $B = C = 50$; $P = y = 40$
21. $\frac{25}{4}$ 22. -5 23. 0
24. $2x$ 25. $-\frac{x^8}{2x^7}$ 26. $-2xa^{-1} - 5x^{-1}a^{-1}$
27. $-\frac{129}{512}$ 28. 19 29. 3 30. 27

practice

a. 48 and 60 b. 93 and 43

problem set 21

1. 36 and 60 2. 133 and 67 3. 2250 kg 4. 185 kg 5. 25 nickels
6. $-5, -4, -3$ 7. (6, 5) 8. $8x^3 - 16x^2 + 10x - 6$ 9. $T_K = 8$; $T_N = 16$
10. $50\sqrt{2}$ 11. $144 - 24\sqrt{3}$ 12. $\frac{4pm + 1}{p}$ 13. $\frac{m^2 - 3ax - a^2m}{a^2x^2}$ 14. 1.5×10^{-13}
15. 7 16.



17. (a) $y = -2$ (b) $y = -2x$ 18. $y = -5$
19. $y = -\frac{3}{7}x + \frac{20}{7}$ 20. $x = 2$; $y = 8$
21. $A = 50$; $B = C = 40$; $D = y = 50$
22. $\frac{39}{128}$ 23. 24 24. 14
25. $-10x^{-4} - 5x^{-3}$ 26. $4x^6y^2$ 27. $5xa$
28. $-\frac{1}{12}$ 29. 0 30. 5

practice

a.  126 miles b. $x = \frac{35}{6}$; $y = \frac{15}{2}$

problem set 22

1.  90 miles 2.  18 kph 3. 560 and 400 4. \$3700
5. 8 pecks 6. 4750 grams 7. (4, 4) 8. $x^2 + x - 3 - \frac{1}{x-1}$ 9. $x = 18$; $y = \frac{33}{2}$
10. $-9\sqrt{3}$ 11. $48\sqrt{3} - 70$ 12. $30 - 12\sqrt{2}$ 13. $\frac{2x-1}{x}$ 14. $\frac{5x^2p + p^3y - 3x}{py}$

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