AIMS Grade 8 Mathematics Sample Test and Think-Throughs

FOR STUDENTS

GRADE 8

Arizona Department of Education
John Huppenthal, Superintendent of Public Instruction

Assessment Section
Arizona Department of Education
1535 West Jefferson Street, Bin #6
Phoenix, Arizona 85007
Deputy Associate Superintendent of Assessment: Roberta Alley
Tel: (602) 542-5031
Fax: (602) 542-5467

Testing Inquiries:
Testing@azed.gov

Introduction

AIMS sample tests are provided to give students experience in taking AIMS. The samples are not meant to be practice tests, but they offer a sample of the kinds of questions students will find on AIMS. The best way to make sure you have the knowledge necessary to Meet and Exceed on AIMS is to *be in class*, *be prepared*, and *be on time to class* each day. Learning in class and through homework is the basis of meeting proficiency on AIMS.

It is understandable that sometimes students get nervous when taking tests. They may need some help with test-taking strategies. In this document, you will not only be able to take an AIMS sample test for mathematics, but you will also find that some of the items have explanations of the process used for solving them. This will help you think through the problems, just like you do in class. There will also be more application problems, like the ones explained, so you can try them on your own.

As you go through the sample test, please remember a few important facts.

- The AIMS Mathematics Sample Tests follow the AIMS mathematics blueprints for the 2008 Mathematics Academic Standards, but only represent half the number of items that are on the actual AIMS 3-8 and AIMS HS assessments.
- The best way to study for AIMS is to be sure you know and are able to do the grade-level performance objectives in each content area tested. Your teacher creates your lessons based on all of these grade-level mathematics standards.
- The activities contained in this document will give you experience in taking AIMS. It is not a practice test. Practice by doing your homework.
- Work through the sample test as if it is the AIMS – don't use a calculator or any other support materials. The reference sheets for formulas at the back of this guide are the same as those that are included in actual AIMS testing. Use the reference sheets to become familiar with them.

When you look at the sample problems that show the solution process, you will also see listed on the answer key the Strand, Concept, and Performance Objective that is being measured. This is listed so you can see how it connects to the lessons your teacher creates from the AZ Academic Standards. Read through the samples and see how your thoughts and answers compare.

The guide will help you make better response choices based on the knowledge that mastery of the grade-level standard provides.

Good luck and have fun!

Mathematics Sample Test

Grade 8

Directions: **Read each problem and select the best answer.**

1 There are 6 books on a reading list. Students must read 3 of the books on the list. In how many different ways can a student select 3 books?

A 20

B 60

C 120

D 360

2 Cece scored a 78 on her first math test. She scored an 84 on her second test. What is the percent increase, rounded to the nearest tenth, from Cece's first score to her second score?

A 6.0%

B 7.6%

C 7.7%

D 8.0%

3 How many square feet are there in 288 square inches?

Scale
1 foot = 12 inches

A 2

B 24

C 93

D 144

4 Gary has 10 coins in his pocket.

- 2 quarters
- 5 dimes
- 3 nickels

Without looking, Gary pulls one coin from his pocket and puts it on a table. Then, he pulls one more coin from his pocket. What is the probability that the first coin is a dime and the second coin is a nickel?

A $\frac{1}{8}$

B $\frac{1}{6}$

C $\frac{1}{5}$

D $\frac{1}{2}$

5 A tower is 160 feet tall and casts a shadow 34 feet long. A person standing next to the tower casts a shadow 1.5 feet long. Which equation will find the height of the person, x?

A $\frac{160}{34} = \frac{1.5}{x}$

B $\frac{x}{160} = \frac{34}{1.5}$

C $1.5x = 34 \cdot 160$

D $34x = 1.5 \cdot 160$

Go On ▶

6 Melissa earned a score of 75% on her first test. She wants to earn an 85% on her second test. What is the percent increase, rounded to the nearest whole number, from 75% to 85%?

A 10%

B 12%

C 13%

D 14%

7 Which shape will create a tessellation using only translations?

A scalene triangle

B regular hexagon

C equilateral triangle

D isosceles trapezoid

8 A box contains 4 red pencils, 3 blue pencils, and 3 yellow pencils. What is the probability that a student randomly selects a blue pencil, keeps it, and then a second student randomly selects a yellow pencil?

A $\frac{1}{10}$

B $\frac{3}{10}$

C $\frac{6}{10}$

D $\frac{9}{10}$

9 Which statement is true?

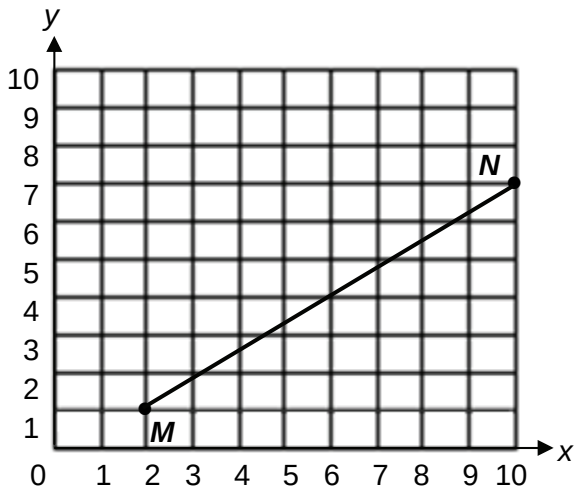
A All vertical lines have a slope of zero.

B All vertical lines have a positive slope.

C All vertical lines have a negative slope.

D All vertical lines have an undefined slope.

10 Look at $\overline{MN}$ on the coordinate plane.



What is the distance between the endpoints of $\overline{MN}$?

A 5 units

B 6 units

C 8 units

D 10 units

Go On ▶

11 Emily, Zeke, Harry, and Brook each conducted surveys on the number of books people have in their homes. Then they each answered the question below.

"Must all measures of central tendency appear as a number in the set of data collected?"

Which student's statement is true?

A Emily says this is always true because all the measures of central tendency also have to be numbers in the set of data.

B Zeke says this is never true because all the measures of central tendency are never numbers in the set of data.

C Harry says this is sometimes true because the mean and median may or may not be in the set of data, but the mode is always in the set of data.

D Brook says this is sometime true because the mean and mode may or may not be in the set of data, but the median is always in the set of data.

12 The stem-and-leaf plot represents test scores from two science classes.

Mr. Vega		Ms. Watson
	10	0
4, 3, 1	9	1, 4
8, 5, 4	8	2, 4, 5, 6, 7
8, 7, 6, 0	7	0, 0, 2, 9
9, 6, 6	6	3, 6, 8
4, 2	5	

Key
10 | 0 means 100

Which statement about the data is true?

A The median of Ms. Watson's scores is less than the median of Mr. Vega's scores.

B The mode of Ms. Watson's scores is less than the mode of Mr. Vega's scores.

C The mean of Mr. Vega's scores is greater than the mean of Ms. Watson's scores.

D The range of Mr. Vega's scores is greater than the range of Ms. Watson's scores.

13 Students submitted pictures for the school yearbook. Only $\frac{4}{5}$ of the submitted pictures fit in the yearbook. There were 105 pictures that did not fit. Approximately how many total pictures were submitted for the yearbook?

A 105

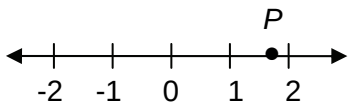
B 210

C 420

D 500

Go On ▶

14 Look at the number line.



Which value does *P* **best** represent?

A $1\frac{1}{3}$

B $1\frac{1}{2}$

C $1\frac{2}{3}$

D $2\frac{1}{3}$

15 Three linear equations are shown below.

$$y_1 = -2x - 5$$
$$y_2 = -\frac{1}{2}x - 5$$
$$y_3 = 3x - 5$$

Which statement about the three linear equations is incorrect?

A All three equations have the same slope.

B Equations y_1 and y_2 have negative slopes.

C All three equations have the same *y*-intercept.

D Equations y_2 and $y_3$have the same *y*-intercept.

16 A go-cart has a maximum weight limit of 240 pounds. Which inequality correctly represents this weight limit, *w*?

A $w \leq 240$ pounds

B $w < 240$ pounds

C $w \geq 240$ pounds

D $w > 240$ pounds

17 Joe is creating a number pattern. He begins the pattern with the number 3. Each number after 3 is twice the number before it, plus 1. Which pattern fits Joe's rule?

A 3, 6, 9, 12, 15

B 3, 6, 13, 27, 55

C 3, 7, 14, 28, 56

D 3, 7, 15, 31, 63

18 Which number is irrational?

A $(1.5)^2$

B $\sqrt{41}$

C $\sqrt{49}$

D $(15)^2$

19 What is the value of the expression?

$$\left|-5+(-3)^2\right|$$

A –14

B –4

C 4

D 14

20 Santos has a job after school. He earns $8 per hour. Which equation will determine *h*, the number of hours he needs to work to earn $44?

A $h - 8 = 44$

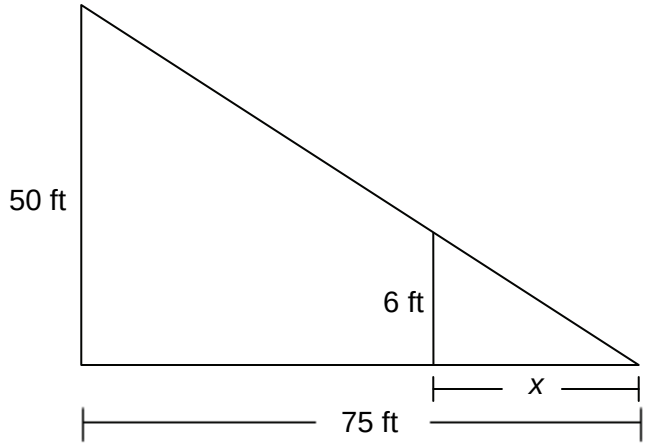
B $8h = 44$

C $8 + h = 44$

D $\frac{h}{2} = 44$

Go On ▶

21 Look at the figure.



Based on the figure, which equation is **not** true?

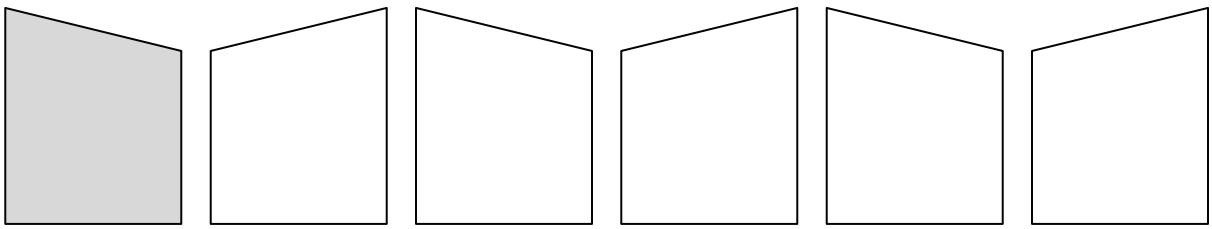
A $\frac{50}{75} = \frac{6}{x}$

B $\frac{50}{6} = \frac{75}{x}$

C $300 = 75x$

D $450 = 50x$

22 The shaded piece has been transformed into a frieze pattern.



Which transformations **best** describe how the pattern was created?

A reflections

B translations

C reflections and rotations

D translations and rotations

Go On ▶

23 What is the value of the expression when $x = 7.2, y = \frac{3}{4}$, and $z = -3$?

$$2x + \frac{2}{3}z - 8y$$

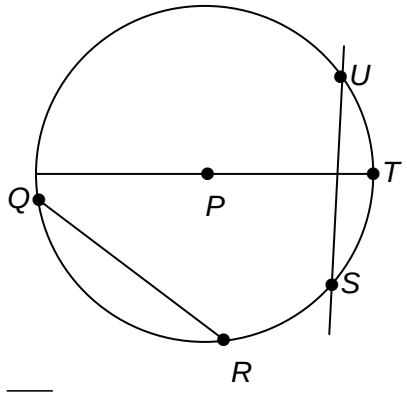
A 6.2

B 6.4

C 10.4

D 38.9

24 In circle *P*, which of the following create a secant?



A $\overline{QR}$

B $\overrightarrow{PT}$

C $\overleftrightarrow{US}$

D $\overset{\frown}{RT}$

25 A right cylinder has a height of 5 inches and a radius of 7 inches. What is its volume in terms of π?

A 70π cubic inches

B 168π cubic inches

C 175π cubic inches

D 245π cubic inches

26 The student council is making gift bags for a fund raiser. They have 105 bags, 150 pens, 115 notebooks, 330 pencils, and 190 highlighters. If each gift bag consists of one bag, 2 pens, 1 notebook, 3 pencils, and 2 highlighters, what is the greatest number of gift bags that can be made?

A 75

B 95

C 105

D 110

27 What is the value of the expression?

$$\frac{2+2(3+7)^2 - \sqrt[3]{73-9}}{3}$$

A 34

B 64

C 66

D 132

28 John is comparing his quiz scores from two weeks in math class.

Week 1: 78, 81, 86, 86, 89
Week 2: 79, 85, 86, 88, 92

Which summary statistic is the same for both weeks?

A mean

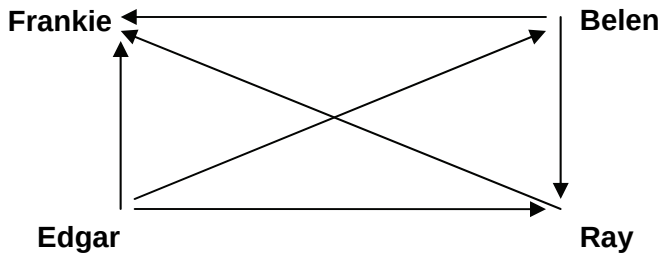
B median

C mode

D range

Go On▶

29 The directed graph shows the results of a chess tournament among 4 players. Edgar won his match against Frankie.



Who won the least number of games?

A Frankie

B Belen

C Ray

D Edgar

30 What equation is the rule for the function illustrated by the table of values?

x	–2	–1	0	1	2
y	–4	–1	2	5	8

A $y = -3x + 2$

B $y = 3x + 2$

C $y = 2x$

D $y = -2x$

31 What is the value of the expression when $a = 5$, $b = \frac{1}{3}$, and $c = 2$?

$$a^2 - 9bc$$

A –29

B 4

C 14

D 19

***Go On*▶**

32 Which situation is **best** represented by the graph?

A the height of a person growing from child to adult

B the amount of gasoline in a car tank, from fill-up to empty

C the altitude of a plane during a trip, from take-off to landing

D the temperature of a pizza after it has been taken out of the oven

33 Joe needs to find the midpoint of a line segment on a coordinate plane. Given the coordinates of the endpoints, what is the **best** way for him to find the midpoint of the line segment?

A substitute the coordinates into the midpoint formula

B substitute the coordinates into the point-slope formula

C plot them on graph paper, draw the line, and count the squares to the middle

D plot them on graph paper, create a right triangle, and use the Pythagorean Theorem

34 Martin is buying a fish tank. For the tank, he wants 10 clownfish, a few plants, and some stones for the bottom. He wants to make sure that the tank is large enough for the fish to swim comfortably. What does he need to ask the salesman in order to make sure he buys a large enough tank?

A What type of food do clownfish eat?

B How long do clownfish typically live?

C What kind of plants do clownfish like?

D How much space do clownfish need to swim?

AIMS Grade 8 Mathematics Sample Test Answer Key

The answer key below shows you the Strand, Concept, and Performance Objective that each item is addressing. This will help you to identify which Concepts from the AZ Academic Mathematics Standards that you may need to study more.

1	2.3.2	**A**
2	3.4.2	**C**
3	4.4.1	**A**
4	2.2.1	**B**
5	5.1.1	**D**
6	3.4.2	**C**
7	4.2.2	**B**
8	2.2.3	**A**
9	5.2.12	**D**
10	4.3.2	**D**
11	5.2.9	**C**
12	2.1.2	**D**
13	1.3.1	**D**
14	1.3.2	**C**
15	5.2.12	**A**
16	3.3.1	**A**
17	3.1.1	**D**

18	1.1.2	**B**
19	1.1.4	**C**
20	3.3.1	**B**
21	4.1.3	**C**
22	4.2.2	**A**
23	3.3.2	**B**
24	4.1.1	**C**
25	4.4.3	**D**
26	1.2.1	**A**
27	1.2.5	**C**
28	2.1.2	**B**
29	2.4.1	**A**
30	3.2.3	**B**
31	3.3.2	**D**
32	3.2.1	**C**
33	4.3.1	**A**
34	5.2.3	**D**

AIMS Grade 8 Mathematics Think-Throughs & Practice Applications

The problems on the following pages are from the sample test you just finished. They have been worked out for you to show the thought process behind finding the answers.

As you go through them, see how your thoughts compare to the ones given. Not every problem from the sample test will be shown in this same manner.

The number for each problem matches the same number that it is in the sample test. This way, if you got the problem incorrect you can compare your answers and go back to see what you may have done differently.

Then, after each Think-Through problem, you will find two more problems to apply what you just learned from the Think-Through problems. These will be very similar to the Think-Through problem. They are also testing the same academic performance objective. This will give you even more practice to think through your own problem solving process.

As you read through the solution process of the problems, you may notice that some of the words are *italicized*. This indicates some mathematics terms that would be helpful to know.

After the two application problems, there will be a Summary Statement which explains the basic concept that the problems are testing. This will help you to understand which concepts you may need more work on or which concepts you may have mastered.

3 How many square feet are there in 288 square inches?

Scale
1 foot = 12 inches

A 2

B 24

C 93

D 144

This problem is asking me to *convert*, or change, *square inches* into *square feet*. And, just in case I do not know that 12 inches is the same as 1 foot, it is given to me in the key.

The first thing that I think of when I see that I have to convert one unit into another is to make a *proportion*. I will set up a *proportion* in order to know how much of one unit is equal to another unit.

Since I know that 1 foot equals 12 inches, that will be my first proportion,1 foot : 12 inches. But I need to know *square* feet. I will square the proportion to go from feet and inches to *square feet* and *square inches*. The exponent applies to the numbers as well as the units.

$$\frac{\text{feet}}{\text{inches}} \quad \left(\frac{1}{12}\right)^2 = \frac{1}{144} \quad \frac{\text{square feet}}{\text{square inches}}$$

Now I can complete my proportion. I will make a second proportion for what I need to find. The problem tells me I have 288 *square inches*, but I do not know how many *square feet*. Since the number of square feet is my unknown, I will call it x.

I need to set up the proportion the same way as my first proportion, with the square feet in the numerator and the square inches in the denominator.

$$\frac{\text{square feet}}{\text{square inches}} \quad \frac{1}{144} = \frac{x}{288}$$

The next step looks like I should cross-multiply.

$$\frac{\text{square feet}}{\text{square inches}} \quad \frac{1}{144} = \frac{x}{288}$$

$$288 \cdot 1 = 144x$$

Then, since I need to get *x* by itself, I divide each side by 144.

$$\frac{288}{144} = \frac{144x}{144}$$

Now I see that *x* is 2. That means there are 2 square feet in 288 square inches, which is answer choice ***A***.

$$2 = x$$

3a How many square yards are in 36 square feet?

Scale
1 yard = 3 feet

A 4

B 12

C 81

D 108

3b One can of spray paint covers 4 square feet. How many square inches will it cover?

Scale
1 foot = 12 inches

A 24

B 48

C 144

D 576

Summary Statement:
These problems look at solutions involving conversions within the same measurement system. Students can use proportional reasoning to solve problems.

5 A tower is 160 feet tall and casts a shadow 34 feet long. A person standing next to the tower casts a shadow 1.5 feet long. Which equation will find the height of the person, x?

A $\frac{160}{34} = \frac{1.5}{x}$

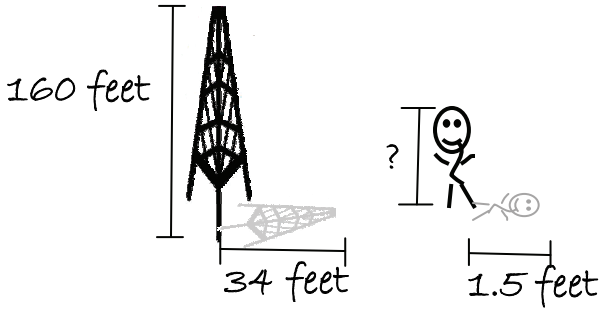
B $\frac{x}{160} = \frac{34}{1.5}$

C $1.5x = 34 \bullet 160$

D $34x = 1.5 \bullet 160$

I notice that this problem is asking me to find an equation, not an answer. And, I see that all of the answer options are equations since they have equals signs, so I need to set up a problem for myself as if I were going to find the answer.

I will draw a picture with the measurements to help me better visualize this problem.



Now that I see what I have, it looks like I need to create a *proportion*. Since I know the height of the tower and the length of its shadow, that will be my first proportion.

Tower proportion 160 feet to 34 feet or $\frac{160}{34}$ $\frac{\text{actual height}}{\text{shadow length}}$

My next proportion will be for the person. Since I do not know the height of the person, I will call that x. I need to set up the proportion the same way as my first proportion, with the actual height as the numerator and the shadow length as the denominator.

Person proportion x feet to 1.5 feet or $\frac{x}{1.5}$ $\frac{\text{actual height}}{\text{shadow length}}$

Since the problem is asking for an equation, I will set my proportions equal to each other.

Actual height / Shadow length $\frac{160}{34} = \frac{x}{1.5}$

(continued on page 17)

So, my equation is $\frac{160}{34} = \frac{x}{1.5}$. Uh oh. I do not see that as an answer choice. *A* and *B* are proportions and somewhat look like the one I created, but they are not the same and are not correct. I will take the proportion I created and go one step further.

I will cross multiply. This will look more like answers *C* and *D*. $\frac{160}{34} = \frac{x}{1.5}$

When I do this, I get $34x = 160 \cdot 1.5$

Now this looks like answer choice ***D***.

It is really important to keep on going when solving a problem. Even though what I got at first did not match the answer choices, that did not mean I was incorrect. I was sure that I created the proportion correctly. Since this problem wanted me to find an equation, I needed to make sure that I found the correct equation and just take it one step further.

5a A tree is 15 feet tall and casts a shadow of 4 feet in length. A child standing next to the tree casts a shadow that is 0.25 feet in length. Which is equation can be used to find the height of the child, x?

A $\frac{15}{4} = \frac{x}{0.25}$

B $\frac{15}{0.25} = \frac{4}{x}$

C $0.25x = 4 \bullet 15$

D $15x = 4 \bullet 0.25$

5b A group of middle school students want to find the height of the school flagpole. They measure the shadow of the flagpole and find it to be 4.75 feet. One of the students, who is 5 feet tall, stands next to the flagpole. Her shadow is 2 feet in length. Which equation can the students use to find the height of the flagpole, x?

A $\frac{2}{5} = \frac{x}{4.75}$

B $\frac{2}{x} = \frac{5}{4.75}$

C $4.75 \bullet 2 = 5x$

D $5 \bullet 4.75 = 2x$

Summary Statement:
These problems involve creating algorithms to solve based on indirect measurement, using proportional reasoning, dimensional analysis, and the concepts of density and rate. There is a strong connection between this performance objective and converting within measurement systems.

9 Which statement is true?

A All vertical lines have a slope of zero.

B All vertical lines have a positive slope.

C All vertical lines have a negative slope.

D All vertical lines have an undefined slope.

The question is asking me to decide which statement is true. Therefore, I must read through each statement and carefully think about what each one means. First I will draw a vertical line so I can visualize as I think.

Choice **A** states…**All vertical lines have a slope of zero**.

This statement is saying that every line that is *vertical*, or straight up and down, has a *slope* of zero. I remember that *slope* is how steep a line is counting from left to right, like if I were climbing up or going down a hill. If a slope is zero, that means there is no change in how steep it is. If there is no slant at all, that sounds like it would be a horizontal line.

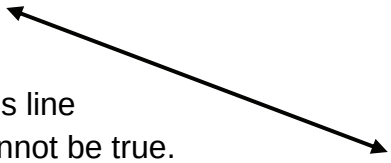
This statement cannot be true.

Choice **B** states…**All vertical lines have a positive slope**.

When a slope is positive, that means the slope is slanting up from left to right, like if I was climbing a hill. Looking back at my drawing of the vertical line, this line is straight up and down. It does not have a slant. This statement cannot be true.

Choice **C** states…**All vertical lines have a negative slope.**

This is like the opposite of choice B. When a slope is negative, that means the slope is slanting down from left to right, like if I was going down a hill. Looking back at my drawing of the vertical line, this line is straight up and down. It does not have a slant. This statement cannot be true.



Choice **D** states…**All vertical lines have an undefined slope.**

If a slope is undefined, that means it has a rise, how much the line goes up, but no run, how much it moves across. Since a vertical line is only up and down, with no across, this statement sounds true. So, my answer is choice ***D***.

Another way to think about this problem would be to plot two points of a vertical line on a coordinate grid. I could count the rise (*y*-axis units) and divide it by the run (*x*-axis units). I would get a 0 for the x-axis units. When 0 is the denominator of a fraction, it is undefined.

9a Which statement does **not** describe a linear relationship?

A All linear equations are straight lines.

B All linear equations must cross the *x*-axis.

C If the slopes of two lines are the same, the lines go in the same direction.

D If the y-intercepts of two lines are the same, the lines cross the y-axis at the same point.

9b Which of the following is **not** a linear relationship?

A The path of a baseball after it has been hit.

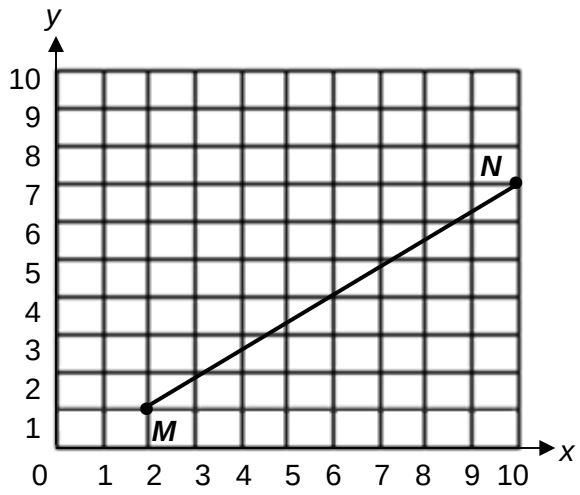
B The amount of water collected from a dripping faucet.

C The cost of movie tickets and the number of tickets purchased.

D The mass of an object that constantly gains weight at the same rate.

Summary Statement:
These problems are about making, validating, and justifying conclusions and generalizations about linear relationships. This objective tests thought process skills which could include any area of linear relationships, not just slope.

10 Look at $\overline{MN}$ on the coordinate plane.



What is the distance between the endpoints of $\overline{MN}$?

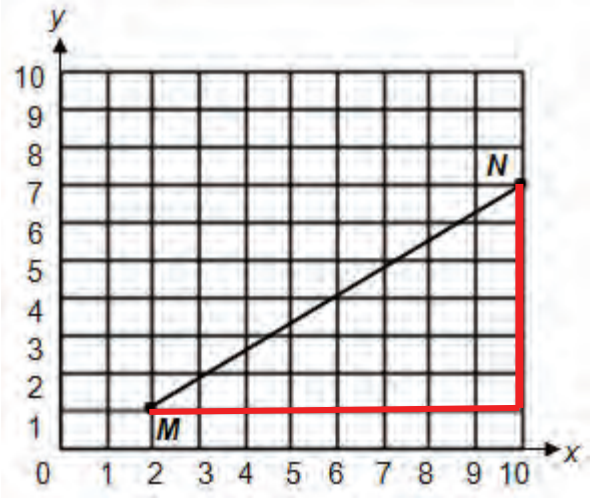
A 5 units

B 6 units

C 8 units

D 10 units

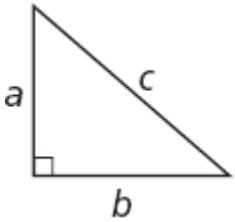
I need to find the distance between the points *M* and *N*. At first it looks like I could count the squares, but that would not be correct. Distance cannot be measured on the diagonal, because the diagonal of a square is longer than its height or its width.



Since the endpoints are plotted for me on the coordinate plane, I have a good visual. The segment that is drawn already looks like part of a triangle. I will draw the remaining sides to create a triangle.

Now I see that I have a right triangle. And, the first thing that I think of when I have a right triangle is the *Pythagorean Theorem.* Even if this had not come to mind, I know that I can refer to the Grade 8 AIMS Reference Sheet. On it I see a picture that looks like the triangle that I made. I will use the *Pythagorean Theorem* to find the distance between points *M* and *N*.

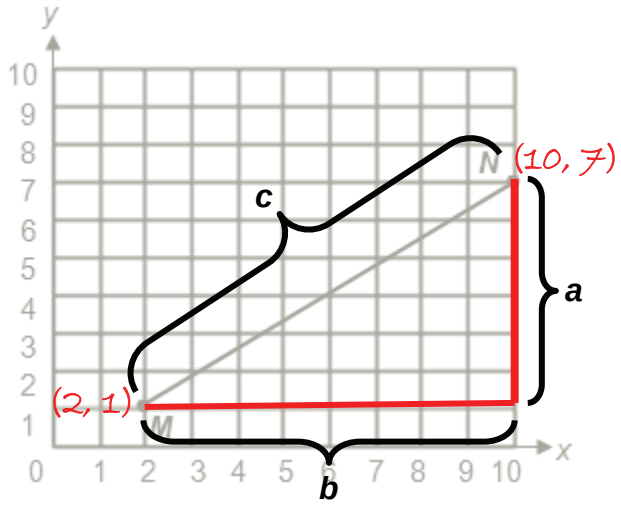
Pythagorean Theorem:

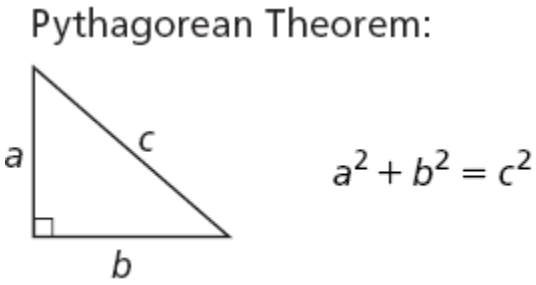


$$a^2 + b^2 = c^2$$

(continued on page 22)

When I compare the image from the *Pythagorean Theorem* to the one in the problem, I see that I am solving for *c* in my triangle. First, I will find the values for *a* and *b* in my image.





To find the value of side b of the right triangle, I can take the absolute value of the difference of the *x* coordinate of the two vertices, or I can count the squares on the coordinate grid.

$$b = |2 - 10| = 8 \text{ units}$$

To find the value of side a of the right triangle, I can take the absolute value of the difference of the *y* coordinate of the two vertices, or I can count the squares on the coordinate grid.

$$a = |7 - 1| = 6 \text{ units}$$

Now I can substitute those values into the *Pythagorean Theorem* to find *c*.

$$a^2 + b^2 = c^2$$
$$6^2 + 8^2 = c^2$$
$$36 + 64 = c^2$$
$$100 = c^2$$
$$\sqrt{100} = \sqrt{c^2}$$
$$10 = c$$

After doing all of the work, I find that *c*, or the distance between *M* and *N*, is 10 units, which is answer choice ***D***.

10a Segment *ST* has endpoints (6, 2), and (1, 14). What is the distance between these two endpoints?

A 5 units

B 6 units

C 12 units

D 13 units

10b Segment *QR* has endpoints at (–1, –2) and (2, 2). What is the distance between these two endpoints?

A 3 units

B 4 units

C 5 units

D 6 units

Summary Statement:
These problems involve students creating right triangles and using the Pythagorean Theorem to find distance between two points in the coordinate plane.

13 Students submitted pictures for the school yearbook. Only $\frac{4}{5}$ of the submitted pictures fit in the yearbook. There were 105 pictures that did not fit. Approximately how many total pictures were submitted for the yearbook?

A 105

B 210

C 420

D 500

The question asks me to find *approximately* how many total pictures were submitted for the yearbook. *Approximately* means I will be *estimating*.

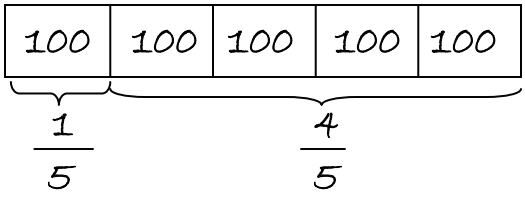
First, I look again at what I know.

- **Students submitted pictures for the school yearbook.**
- **Only $\frac{4}{5}$ of the submitted pictures fit in the yearbook.**
- **There were 105 pictures that did <u>not</u> fit.**

Next, I need to make sense of what I know. I know that $\frac{4}{5}$ of the pictures fit in the yearbook, but I do not know how many pictures this is. It seems like this is important information. This is what gives me the proportion amount so I can find the whole. Since I have $\frac{4}{5}$ of the pictures in the yearbook, it means that $\frac{5}{5}$ represents the whole, or the total pictures submitted.

I also know that there were 105 pictures that did <u>not</u> fit. So if $\frac{4}{5}$ of the total fit, that means that $\frac{1}{5}$ did <u>not</u> fit. And, I also see that 105 is the value for what did <u>not</u> fit. So, 105 represents $\frac{1}{5}$.

Since I am approximating, I will round 105 to 100. Now I can approximate the total. I can do this with a model or with numbers.



$\frac{1}{5}$ represents 100 pictures and there are 5 in a whole.
100 • 5 is approximately 500 total pictures.

I found the estimate is about 500 total pictures, which is answer choice ***D***.

13a All 8th grade students at Franklin Middle School are going on a field trip. Only $\frac{5}{8}$ of the students returned permission slips, which are required in order to participate in the field trip. Of all 8th grade students, 72 did not turn in their permission slips. Approximately how many total 8th grade students are at Franklin Middle School?

A 75

B 125

C 200

D 275

13b Maria brought a jar a jelly beans to a party. Her friends ate $\frac{5}{6}$ of the jelly beans. Maria counted that she had 61 left after the party. About how many jelly beans did Maria's friends eat?

A 60

B 300

C 350

D 400

Summary Statement:
These problems involve making estimates appropriate to a given situation. Students need to determine the level of accuracy needed and select the appropriate method of estimation.

25 A right cylinder has a height of 5 inches and a radius of 7 inches. What is its volume in terms of π?

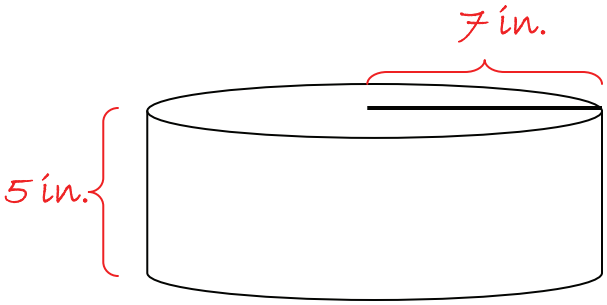
A 70π cubic inches

B 168π cubic inches

C 175π cubic inches

D 245π cubic inches

The question is asking me to find volume of a right cylinder. I will draw a picture to help me visualize this problem.



I know that the height is 5 inches and the radius is 7 inches.

I cannot remember how to find volume, So the first place to look is on the Grade 8 AIMS Reference Sheet.

I look under the section labeled Geometric Solids and I find Right Cylinder. It gives me the notations and the formula for volume.

Geometric Solids: Volumes and Su

Name	Notation	Volume (V)
Rectangular Prism	l = length w = width h = height	$V = lwh$
Right Cylinder	r = radius h = height	$V = \pi r^2 h$

Since I know the values for r and for h, I can substitute those into the formula.

$r = 7$ inches and $h = 5$ inches

$$V = \pi r^2 h$$
$$V = \pi (7)^2 (5)$$
$$V = \pi (49)(5)$$
$$V = \pi 245$$

My answer is 245π. I will leave it with π since the question asks me in terms of π. If I needed to know a value for π, I would look at the reference sheet or it would tell me what to use in the problem.

I started with inches, but since I found *volume*, my inches become *cubic* inches, which is standard for finding volume. So, 245π cubic inches is answer choice ***D***.

25a A right cylinder has a height of 12 inches and a diameter of 10 inches. What is its volume in terms of π?

A 120π cubic inches

B 300π cubic inches

C 480π cubic inches

D 1200π cubic inches

25b A rectangular prism has a length of 7 inches, a width of 4 inches, and a height of 12 inches. What is its surface area?

A 160 square inches

B 272 square inches

C 320 square inches

D 336 square inches

Summary Statement:
These problems involve calculating the surface area and volume of rectangular prisms, right triangular prisms, and cylinders. These formulas can all be found on the reference sheet under Geometric Solids.

27 What is the value of the expression?

$$\frac{2+2(3+7)^2 - \sqrt[3]{73-9}}{3}$$

A 34

B 64

C 66

D 132

Since the question is asking what the value of the expression is, I know that I need to simplify it. This looks complicated, but I do recognize all of the operations in the expression.

In order to simplify this expression correctly, I need to use the proper order of operations: **parentheses**, **exponents**, **multiplication**, **division**, **addition**, **subtraction**.

First, I will carry out what is in the parentheses and what is in the radical.

$$\frac{2+2(3+7)^2 - \sqrt[3]{73-9}}{3}$$

Then, I will carry out the exponent that is on the 10, and the cubed root of 64. I remember that cubed means a number times itself and times itself again. Sine 4 • 4 • 4 • 4 is 64, the cube root of 64 is 4.

$$\frac{2+2 \cdot 10^2 - \sqrt[3]{64}}{3}$$

Next in order is multiplication and division. Normally I would look left to right for multiplication and division and perform whichever comes first. I can't forget the 2 that was outside of the parentheses.

$$\frac{2 + 2 \cdot 100 - 4}{3}$$

$$\frac{2 + 200 - 4}{3}$$

I do also have a denominator, but I will save that for last to see if it can be further simplified. Now I will go to the next operation of addition and subtraction. They follow the same rule as multiplication and division – whichever comes first from left to right. So, first I will add, then subtract.

$$\frac{202 - 4}{3}$$

Now I am left with a much simpler fraction. I will see if I can divide 198 by 3.

$$\frac{198}{3} = 3\overline{)198}\ 66$$

$$-18$$

$$18$$

$$-18$$

$$0$$

198 divides evenly by 3, which is 66. The value of the expression is then 66, or answer choice ***C***.

27a What is the value of the expression?

$$\frac{3-2(3-6)^2-\sqrt[3]{30-3}}{|-3|}$$

A –6

B –2

C 2

D 6

27b What is the value of the expression?

$$\frac{\sqrt{(3-2+4)^2}}{(4\bullet 2-7)^3}$$

A $-\frac{1}{4}$

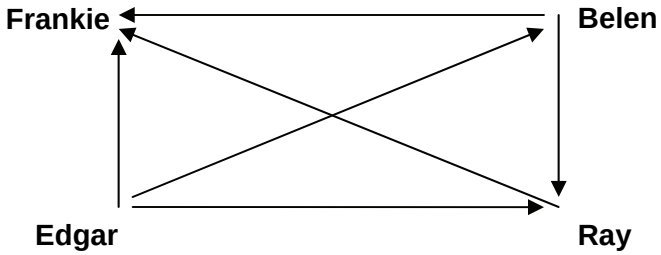
B 1

C $\frac{2}{3}$

D 5

Summary Statement:
These problems include simplifying numerical expressions using the order of operations that include grouping symbols, square roots, cube roots, absolute values, and positive exponents. Also, students are expected to simplify expressions containing exponents, including zero.

29 The directed graph shows the results of a chess tournament among 4 players. Edgar won his match against Frankie.



Who won the least number of games?

A Frankie

B Belen

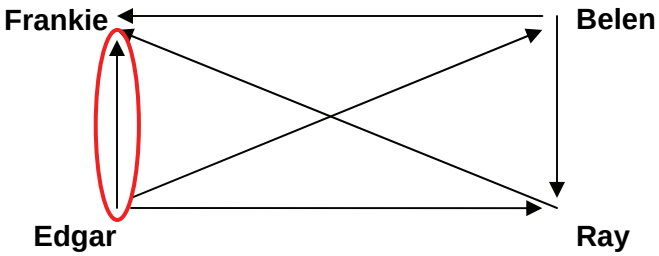
C Ray

D Edgar

This problem is about a tournament. I need to find out who won the **least** number of games, or in other words, who won last place.

What do the arrows mean? When I look at the diagram and read the problem again, it says that **Edgar won his match against Frankie**.

When I look at only those arrows, if Edgar won his match against Frankie, that would mean that the arrow is **pointing to the person** who did **not win** the match.

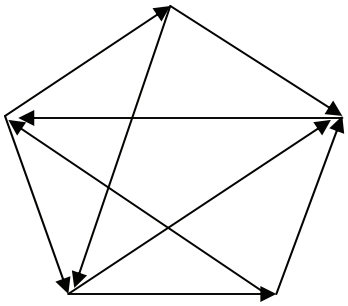


So, if I am supposed to figure out who **won the least number of games**, that means I should look for the person with the **most arrows pointing toward him**.

- Since Edgar has **no arrows pointing toward** him, he won all three of his games.
- Ray has **two arrows pointing toward** him, so he lost two games and won one game.
- Belen has **one arrow pointing toward** her, so she lost one game and won two games.
- Frankie has **three arrows pointing toward** him, so he lost all three games he played.

In other words, Frankie won last place, or won the least amount of games (none). This makes the answer choice ***A***.

29a The directed graph shows the results of a soccer tournament among 5 teams. In this graph, the arrows point to the team that lost the match.



Which statement is true?

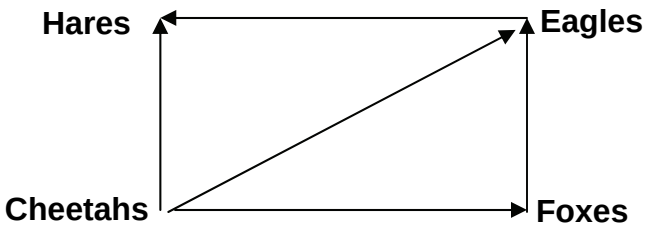
A One team won 4 matches.

B Each team played 4 matches.

C All teams won at least 1 match.

D Two teams each won 3 matches.

29b The directed graph shows the results of a tennis tournament.



Based on the graph, which pair of teams have **not** yet played each other?

A Hares and Eagles

B Eagles and Cheetahs

C Hares and Foxes

D Cheetahs and Foxes

Summary Statement:
Students need to use directed graphs in order to solve these problems. It is important to understand the Hamilton path as used in order to analyze a problem situation.

AIMS Grade 8 Mathematics Practice Applications Answer Key

The answer key below is for the Practice Applications. Included is the Strand, Concept, and Performance Objective that each item is addressing. This will help you to identify which Concepts from the AZ Academic Mathematics Standards that you may need to study more.

Practice Applications Answer Key

Number	3	5	9	10	13	25	27	29
PO	4.4.1	5.1.1	5.2.12	4.3.2	1.3.1	4.4.3	1.2.5	2.4.1
a	A	A	B	D	C	B	A	C
b	D	D	A	C	B	C	D	C

The Think-Through for item number 1 is presented here to provide a better understanding of its solution.

1 There are 6 books on a reading list. Students must read 3 of the books on the list. In how many different ways can a student select 3 books?

A 20
B 60
C 120
D 360

This problem is asking me to choose 3 books from a list of 6 different books.

I know that to find how many different ways I can select 3 different books I can make a list that shows the combination of each. Order doesn't seem to matter since there was no indication that a book needs to be read first, second, or third.

My book list is: *Joy*, *Happy*, *Riptide*, *Explore*, *History*, *Zero*.

I will use a table to make my list using my 6 book titles: *Joy*, *Happy*, *Riptide*, *Explore*, *History*, and *Zero*.

Joy Happy Riptide	*Joy Happy Explore*	*Joy Happy History*	*Joy Happy Zero*	*Joy Riptide Explore*	*Joy Riptide History*	*Joy Riptide Zero*	*Joy Explore History*	*Joy Explore Zero*	*Joy History Zero*
Happy Riptide Explore	*Happy Riptide History*	*Happy Riptide Zero*	*Happy Explore History*	*Happy Explore Zero*	*Happy History Zero*				
Riptide Explore History	*Riptide Explore Zero*	*Riptide History Zero*							
Explore History Zero									

By counting the filled cells, I see there are 20 different ways to select 3 books from a list of 6. That means that the answer is **A**.

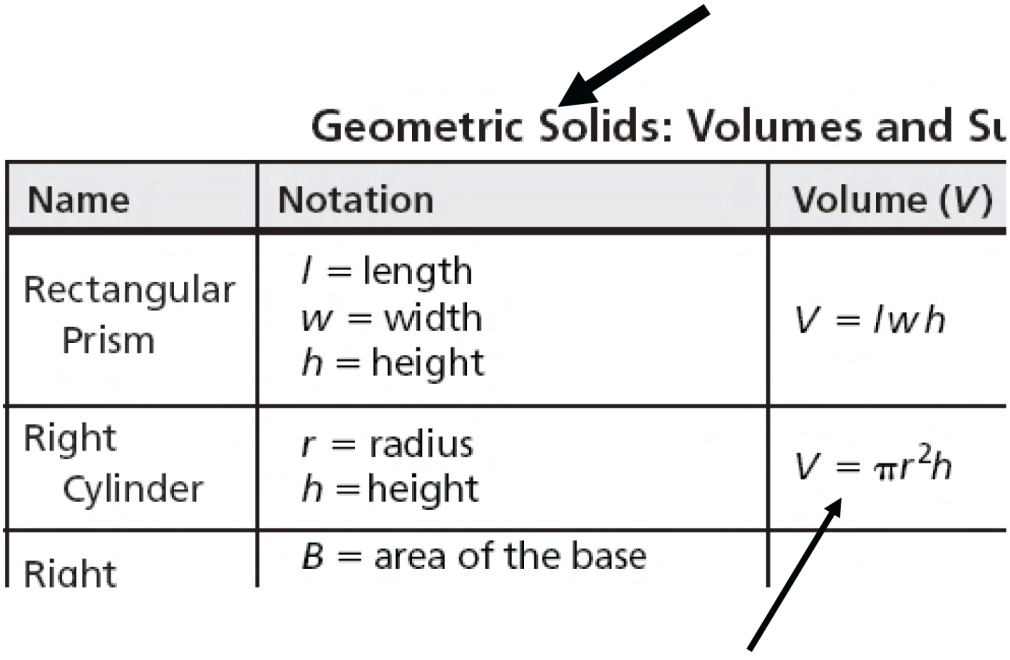
Grade 8 AIMS Reference Sheet

The next two pages contain the reference sheets that are on the AIMS assessment. You can use them when you need formulas in order to solve equations. You can also use them to find other information that may help when problem solving.

The Arizona Department of Education recommends that you also use the Grade 8 AIMS Reference Sheet throughout the school year. This will allow you time to become familiar with its content and format before taking AIMS.

Your teachers can identify the formulas that may be written differently from those printed in your classroom resources and explain to you in more detail how they are organized on the sheet.

Each area of the Reference Sheet is labeled for the particular area of mathematics that it belongs to. For instance, if you are working on a problem that involves 3-dimensional solids and finding volume, you would look in the section labeled *Geometric Solids: Volume and Surface Area*.



Geometric Solids: Volumes and Su

Name	Notation	Volume (V)
Rectangular Prism	l = length w = width h = height	$V = lwh$
Right Cylinder	r = radius h = height	$V = \pi r^2 h$
Right	B = area of the base	

Once you find the appropriate section, you can look under each subtitle for the correct formula.

Not all problems on AIMS will require the use of formulas, but in case you do need one, these sheets are here for you to use.

AIMS Mathematics Reference Sheet
Grade 8

Use 3.14 or $\frac{22}{7}$ for π.

Plane Figures: Perimeters and Areas

Name	Circumference (C) – Perimeter (P)		Area (A)	
	Notation	Formula	Notation	Formula
Circle	r = radius d = diameter	$C = \pi d$ or $C = 2\pi r$	r = radius	$A = \pi r^2$
Parallelogram	a, b = sides	$P = 2(a + b)$	b = base h = height	$A = bh$
Rectangle	l = length w = width	$P = 2(l + w)$	l = length w = width	$A = lw$
Trapezoid	a, b, c, d = sides	$P = a + b + c + d$	b_1 = long base b_2 = short base h = height	$A = \frac{1}{2}h(b_1 + b_2)$
Triangle	a, b, c = sides	$P = a + b + c$	b = base h = height	$A = \frac{1}{2}bh$ or $A = \frac{bh}{2}$

Geometric Solids: Volumes and Surface Areas

Name	Notation	Volume (V)	Surface Area (SA)
Rectangular Prism	l = length w = width h = height	$V = lwh$	$SA = 2lw + 2lh + 2wh$
Right Cylinder	r = radius h = height	$V = \pi r^2 h$	$SA = 2\pi r^2 + 2\pi rh$
Right Prism	B = area of the base h = height P = perimeter of the base	$V = Bh$	$SA = 2B + Ph$

AIMS Mathematics Reference Sheet
Grade 8

Coordinate Geometry and Linear Equation Forms

Given: Points $S(x_1, y_1), T(x_2, y_2)$

Midpoint between two points: Midpoint $= \left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right)$

Slope of line through two points: $m = \frac{y_2 - y_1}{x_2 - x_1}$

Point-Slope Form: $y - y_1 = m(x - x_1)$

Standard or General Form: $Ax + By = C$

Slope-Intercept Form: $y = mx + b$

Additional Formulas

Distance, Rate, Time Formula:
d = distance, r = rate, t = time

$$d = rt$$

Sum of the measures of the interior angles of a convex polygon with n sides:

$$S = (n - 2)(180°)$$

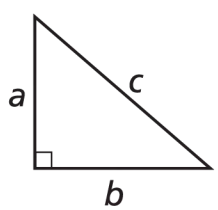
Simple Interest Formulas: I = interest, P = principal,
r = annual interest rate in decimal form, t = time in years, A = total amount after time t

$$I = Prt$$
$$A = P(1 + rt)$$

Density $= \frac{\text{mass}}{\text{volume}}$

Population density $= \frac{\text{number of people}}{\text{unit of area}}$

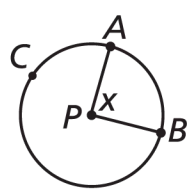
Pythagorean Theorem:



$$a^2 + b^2 = c^2$$

Angle Formulas

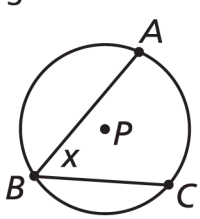
Central Angle Formula:



$$m\angle x = m\overset{\frown}{AB}$$

where P is the center of the circle.

Inscribed Angle Formula:



$$m\angle x = \frac{1}{2} m\overset{\frown}{AC}$$

where P is the center of the circle.

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