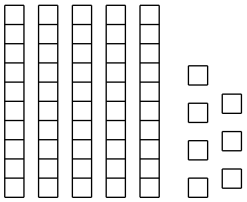
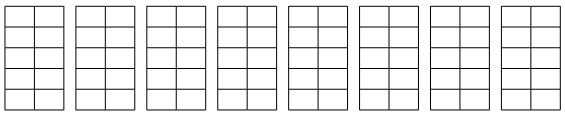
1. Look at the base ten blocks.



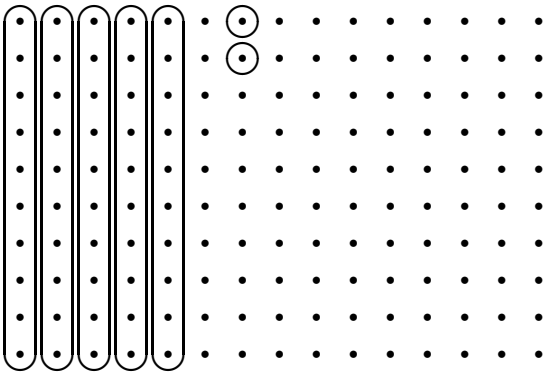
What number is shown?

A. 12 **B.** 57 **C.** 75

2. Use ten frames to build the number 74.



3. Gwen used the dot grid to show a number.



What number is shown?

How many tens?

How many ones?

4. Derrick needs to count the footballs.

84 _____ 86 87 _____ 89 _____

Fill in each blank with the correct number.

5. Justine drew more than 5 squares but less than 7 squares.

How many squares did Justine draw?

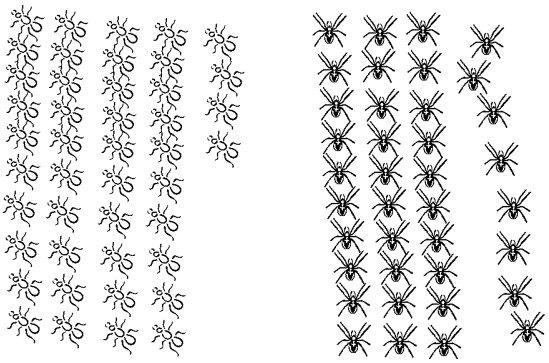
Draw some sticks on your paper.

There are more than ____ sticks.

There are less than ____ sticks.

How many sticks did you draw?

6. Joshua saw ants and spiders at the science academy.



Look at the ants  .

Place the correct number in each box.

Tens	Ones	total number of 

Look at the spiders  .

Place the correct number in each box.

Tens	Ones	total number of 

7. Ms. Depew and Mr. Allison are sales managers.

The managers equally share a corkboard.

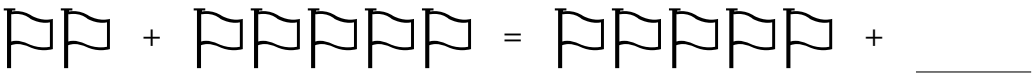
Draw two different ways they can share the corkboard equally.

How many parts?

Name the part that is the entire corkboard.

8. Steven drew some flags.

He wants to show that order does not matter when adding.



What should he draw in the blank?

A. 

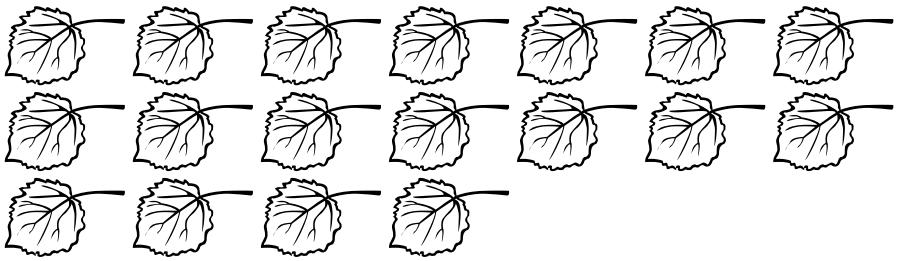
B. 

C. 

D. 

9. Nick found 6 leaves on the sidewalk.

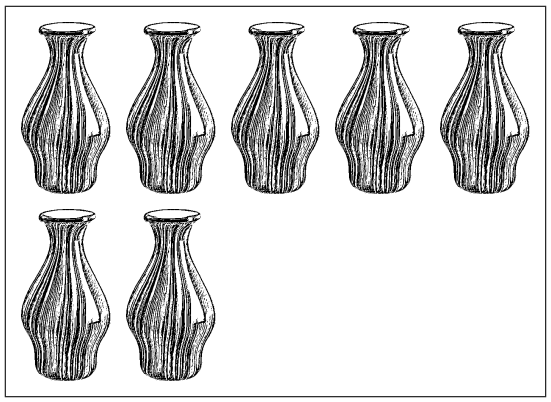
Nick found 12 leaves on the playground.



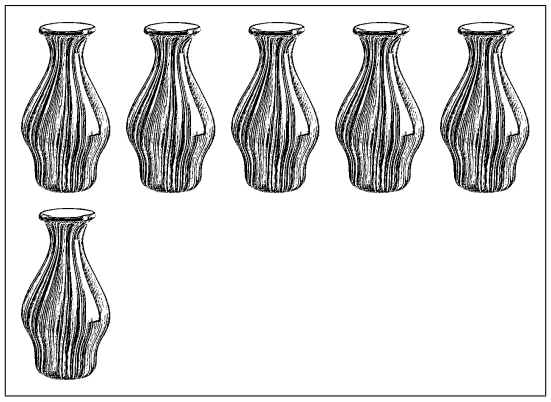
Draw a line around leaves to make a group of ten.

Write a number sentence to show how many leaves in all.

10. Mrs. Kline sold 7 vases.



Then she sold six more vases.



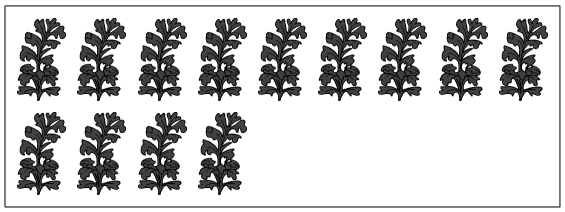
How many vases did Mrs. Kline sell in all?

A. 8 **B.** 11 **C.** 13 **D.** 15

11. Nadina cleaned her fish tank.

There were 13 green plants in the tank.

Nadina removed 6 green plants.



How many green plants in the fish tank now?

A. 5 **B.** 7 **C.** 8 **D.** 19

12. Salvador had nine goats. Then Salvador bought five more goats. Which number sentence could be used to find how many goats Salvador has now?

A. $5 + \square = 9$ **B.** $\square - 5 = 9$

C. $9 - \square = 5$ **D.** $9 + 5 = \square$

13. Madison and Emma each have 6 napkins.

How many napkins do they have in all?

A. 7 **B.** 8 **C.** 10 **D.** 12

14. Mrs. Lewis saw 3 red birds, 4 blue birds, and 7 black birds at her bird feeder. How many birds were at the feeder?

A. 7 **B.** 11 **C.** 14

15. There are thirteen children playing at the park. Six children are playing in the crawl tube. The rest of the children are playing in the sandbox. How many children are playing in the sandbox?

A. 6 **B.** 7 **C.** 8 **D.** 9

16. Brandon places four spoons and 7 forks on the table.

How many fewer spoons than forks?

A. 3 **B.** 4 **C.** 8 **D.** 11

17. Two offices have 17 computers in all.

The Sales Office has 3 more computers than the Advertising Office.

How many computers in each office?

A. Sales Office has 4. Advertising Office has 7.

B. Sales Office has 9. Advertising Office has 6.

C. Sales Office has 11. Advertising Office has 8.

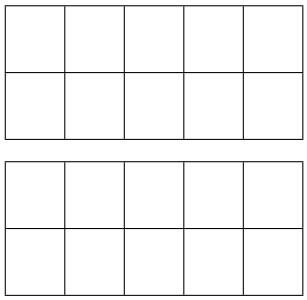
D. Sales Office has 10. Advertising Office has 7.

18. There are 4  at the store.

There are 8  at the store.

How many caps at the store altogether?

Use the ten frames to show your answer.



Write the number sentence.

19. On the movie set there are 8  and 3  .

How many  and  on the movie set altogether?

20. The carpenter has 18 nails in all. There are 4 more long nails than short nails.

How many long nails?

How many short nails?

____ long nails ____ short nails

21. Ann gave her brother a coin with a value between 5¢ and 25¢. Which coin is it?

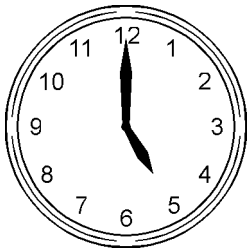
A. 

B. 

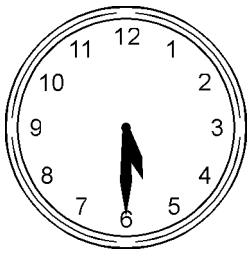
C. 

22. Blake's mom gets home from work between 5:00 and 6:00. Which clock shows a time between 5:00 and 6:00?

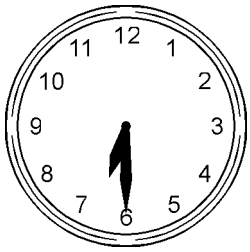
A.



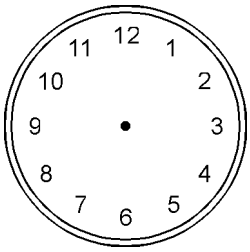
B.



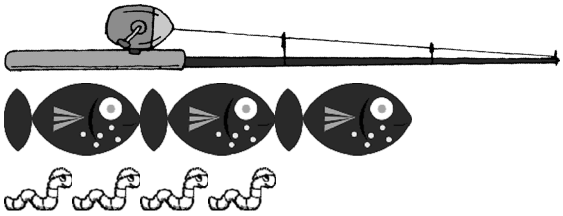
C.



23. Angelo is going to a party at 1:30 on Saturday. Draw the hands on the clock to show 1:30.



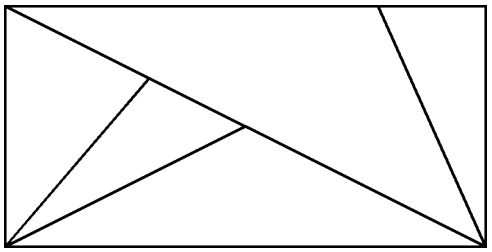
24. The fishing pole is 7 fish long.



How many worms long is the fishing pole?

A. 8 **B.** 12 **C.** 14

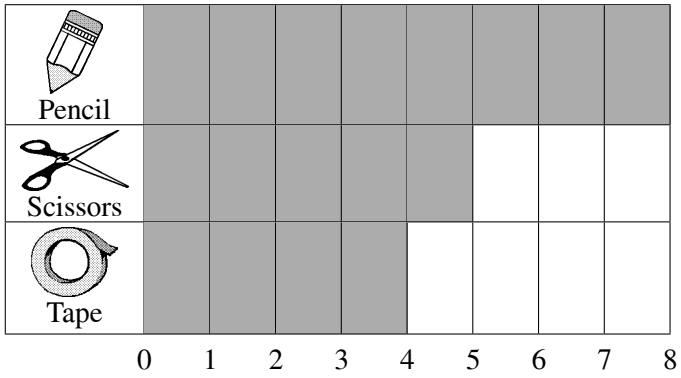
25. Ellen drew this picture in art. How many triangles do you see?



A. 5 **B.** 8 **C.** 9

26. The students in Group #1 made a graph of their school supplies.

School Supplies



Which table matches the graph?

A.

	𝍸
	𝍸
	III

B.

	𝍸 III
	𝍸
	𝍸

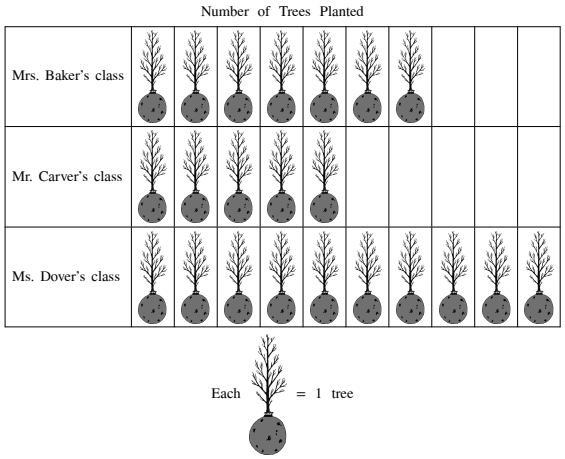
C.

	𝍸 I
	𝍸
	II

D.

	𝍸 I
	𝍸
	II

27. The students in different classes planted trees near the school. The graph shows the number of trees planted by each class.



How many more trees were planted by Mrs. Baker's class than by Mr. Carver's class?

Which class planted the greatest number of trees?

How many trees were planted by the three classes altogether?

28. Look at the pattern.

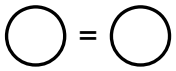
Draw the shapes that follow the pattern.

Tell the rule of the pattern.

Use  to draw your own pattern.

Write the rule for your pattern.

29. Look at the circles and the numbers.



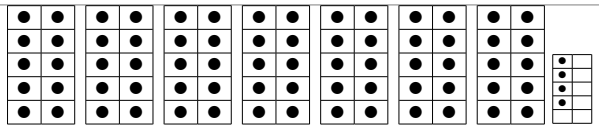
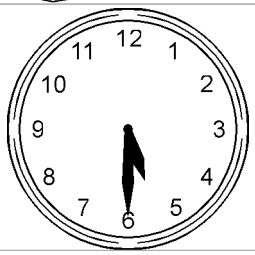
3 7 8 3 2 4 1 2

Place one number in each circle to make a true number sentence.

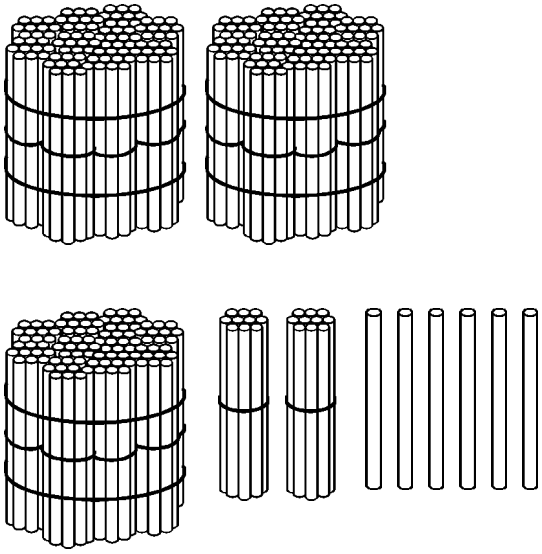
Make as many true number sentences as you can.

Problem-Attic Sample Document
all items from Virginia SOL Math Database

Grade 1

Num	Scoring	Standard	Answer
1	B	1.01A	57
2		1.01A	
3		1.01A	52; 5; 2
4		1.01A	85, 88, 90
5		1.01A	6; [answers vary]
6		1.01B	4, 4, 44; 3, 8, 38
7		1.03	[activity]; 2; whole
8	A	1.05	
9		1.05	6 + 12 = 6 + 2 + 10 = 8 + 10 = 18
10	C	1.06	13
11	B	1.06	7
12	D	1.06	9 + 5 = □
13	D	1.06	12
14	C	1.06	14
15	B	1.06	7
16	A	1.06	3
17	D	1.06	Sales Office has 10. Advertising Office has 7.
18		1.06	12; 4 + 8 = 12
19		1.06	11
20		1.06	11; 7
21	C	1.07A	
22	B	1.08	
23		1.08	[task]
24	C	1.09	14
25	C	1.12	9

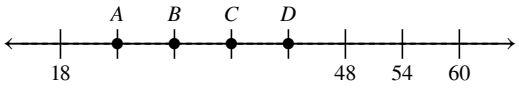
26	B	1.14	 𝍸 |||  𝍸  ||||
27		1.15	2; Ms. Dover's class; 22
28		1.17	◯□◯ square always follows a circle; [answers vary]
29		1.18	[task], examples are 3 = 3, 2 = 2

1. 

What number is shown?

A. 56 **B.** 156 **C.** 263 **D.** 326

2. Which point best represents 36 on the number line?



A. *A* **B.** *B* **C.** *C* **D.** *D*

3. A number has four ones, two tens, and five hundreds. What is the number?

A. 245 **B.** 254 **C.** 542 **D.** 524

4. 

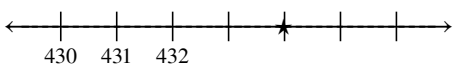
Annabelle jumped the rope 13 times and Lisa jumped the rope 7 times.

What compares the number of jumps?

A. $13 < 7$ **B.** $7 = 13$

C. $7 > 13$ **D.** $13 > 7$

5. Ernest ran between 400 and 500 yards. The dot shows how far Ernest ran. How far did he run?



6. Mr. Fuller counted 36 saws on the rack.

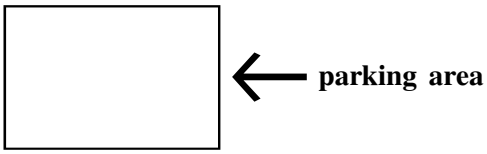
   Build the number 36 with ten frames.

   Build a number smaller than 36.

   Build a number larger than 36.

   Build a number between 36 and 63.

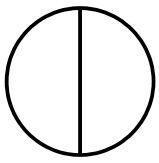
7. The worker divided the parking area into thirds.



   Draw lines to show thirds.

   How many equal parts?

8. The figure is divided into two equal parts.



   Which of these is the fractional name of each part?

   A. $\frac{1}{4}$ **B.** $\frac{2}{2}$ **C.** $\frac{2}{1}$ **D.** $\frac{1}{2}$

9. Alexia wants to count the number of hair bands.

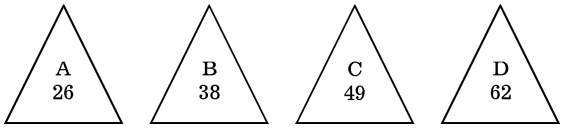
   She made a table to help her count the hair bands.

Package	Number of Hair Bands
1	2
2	4
3	
4	

   Complete the table.

   How many hair bands in 4 packages?

10. Mrs. Calles needs 75 invitations for the birthday party. Which 2 packages should she buy to have exactly enough invitations?



   A. A and B **B.** A and C

   C. B and C **D.** B and D

11. Two cars drove into town. Sixteen clowns got out of one car; 28 got out of the other car. How many clowns got out of the cars?

A. 44 **B.** 34 **C.** 18 **D.** 10

12. Mrs. Sosa planted 35 yellow roses and 29 daisies in the spring time. She also planted 47 red roses. Which method shows how many roses Mrs. Sosa planted?

A. Add 35 and 29.

B. Subtract 35 from 47.

C. Add 35 and 47.

D. Subtract 29 from 35.

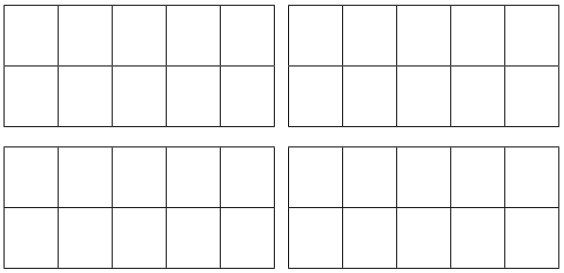
13. The city paved 5 streets.

The city paved 31 more streets.

$5 + 31 = 31 + \square$

Fill in the blank to make a true statement.

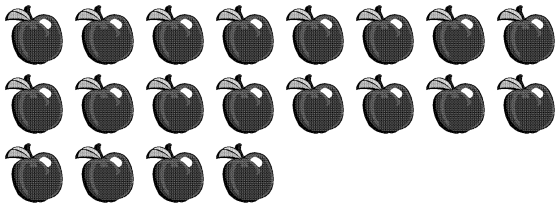
Use the ten frames to show how many streets were paved in all.



Write a number sentence to show the information on the ten frames.

Write another number sentence that names the same number.

14. Oscar had 20 apples. He gave 6 to April. He gave 5 to Jesse.

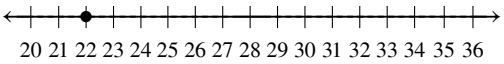


How many apples does Oscar have left?

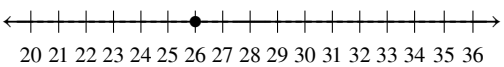
A. 9 **B.** 11 **C.** 13

15. Kira sold 35 rolls of wrapping paper. Landon sold 7 fewer rolls than Kira. Mark sold 6 fewer rolls than Landon. Which number line shows the number of rolls of wrapping paper that Mark sold?

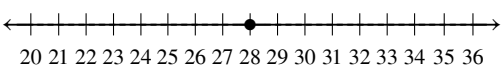
A.



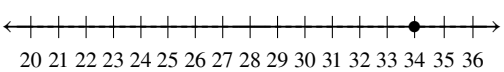
B.



C.



D.



16. Danny and Rene are twins. Danny weighs 92 pounds. Rene weighs 78 pounds. How much more does Danny weigh than Rene?

A. 14 pounds **B.** 26 pounds

C. 160 pounds **D.** 170 pounds

17. There are 9 boys on Jason's soccer team. There are more boys than girls on his team. Which could be the number of players on his soccer team?

A. 14 **B.** 18 **C.** 22 **D.** 26

18. Mrs. Kimbel has a box of 36 nails.

She uses 19 nails to repair the fence.

How many nails are in the box now?

19. Bethany wants a doll that costs 98¢. Which group of coins shows the amount of money Bethany needs to buy her doll?

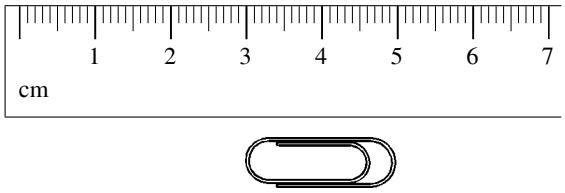
A.

B.

C.

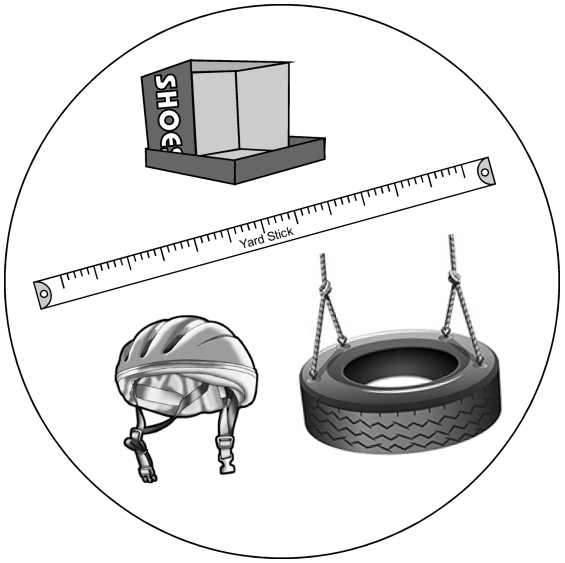
D.

20. About how many centimeters long is the paper clip?



A. 5 cm **B.** 4 cm **C.** 3 cm **D.** 2 cm

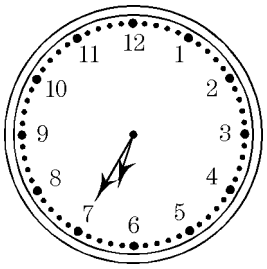
21. Sandra measured the mass of 4 objects. Which object should have the greatest mass?



A. Yard stick **B.** Empty shoebox

C. Bicycle helmet **D.** Tire swing

22. What time does this clock show?



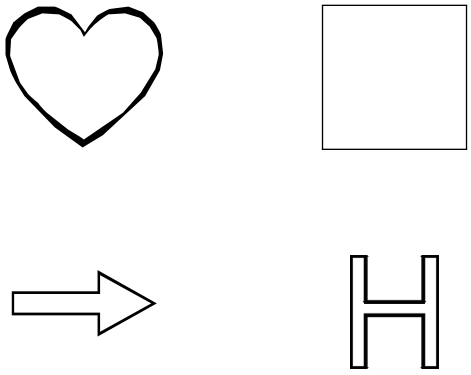
A. 25 minutes before 7

B. 25 minutes before 6

C. 35 minutes after 7

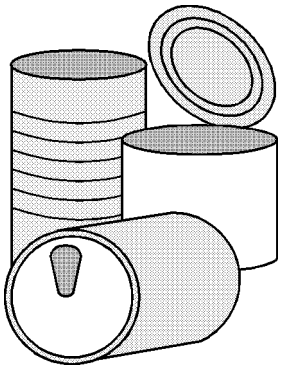
D. 7:30

23. Draw one or more lines of symmetry for each figure.

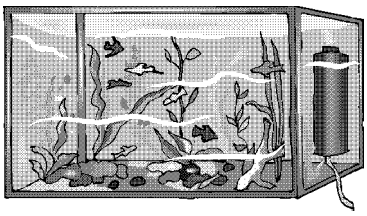


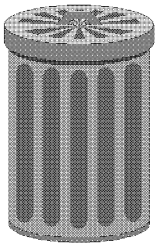
Circle any figure with more than one line of symmetry.

24. These are things at Bobby's house. Which object is the same shape as the cans?

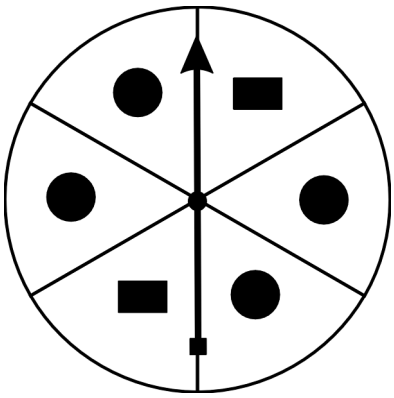


A. 

B. 

C. 

25. Miko spun the spinner 9 times.

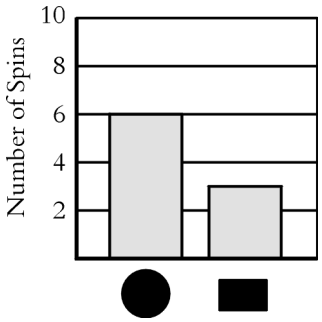


He recorded how many times he landed on each figure in the tally chart.

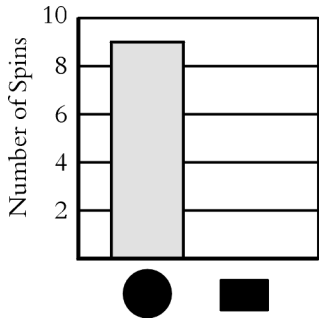
Outcome	Tally
●	𝍸 |
■	|||

Which of these bar graphs matches the information in the tally chart?

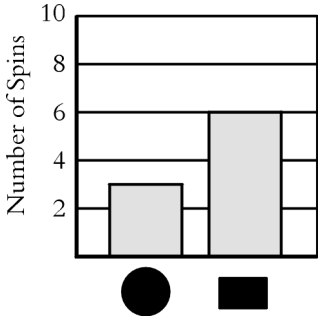
A.



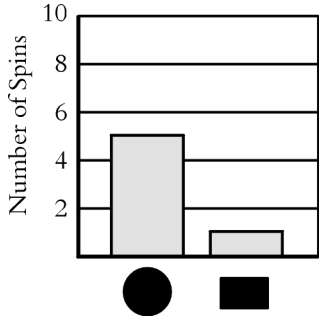
B.



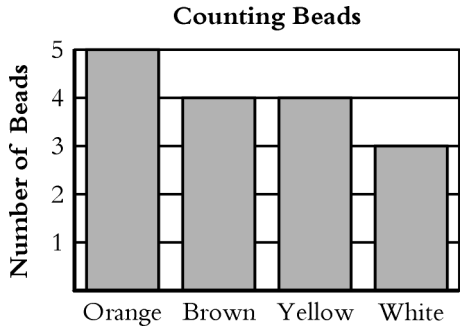
C.



D.



26. Trudi counted the beads in a box. The graph shows the number of beads of each color that Trudi counted.

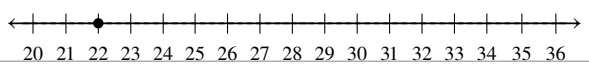


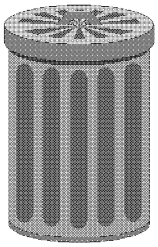
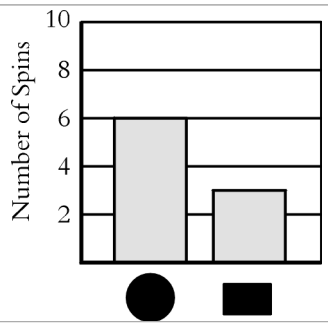
How many beads are in the box in all?

A. 5 **B.** 8 **C.** 16 **D.** 20

Problem-Attic Sample Document
all items from Virginia SOL Math Database

Grade 2

Num	Scoring	Standard	Answer
1	D	2.01A	326
2	C	2.01A	*C*
3	D	2.01A	524
4	D	2.01C	$13 > 7$
5		2.01C	434
6		2.01C	[activity]
7		2.03A	[activity]; three
8	D	2.03B	$\frac{1}{2}$
9		2.04A	8
10	B	2.06B	A and C
11	A	2.06B	44
12	C	2.06B	Add 35 and 47.
13		2.06B	5; 36; $10 + 10 + 10 + 6 = 36$; $30 + 6 = 36$
14	A	2.07B	9
15	A	2.07B	
16	A	2.07B	14 pounds
17	A	2.07B	14
18		2.07B	17
19	D	2.10A	
20	D	2.11A	2 cm
21	D	2.11B	Tire swing
22	A	2.12	25 minutes before 7
23		2.15A	[task]; the square and the letter “H” have more than one line of symmetry

24	C	2.16	
25	A	2.17	
26	C	2.19	16

1. Mrs. Preston is a scientist. During one research study, she examined a total number of specimens that has a value of 30,000 in it and a value of 600 in it. Which number below could have been the total number of specimens she examined?

   A. 438,234 specimens

   B. 523,761 specimens

   C. 189,863 specimens

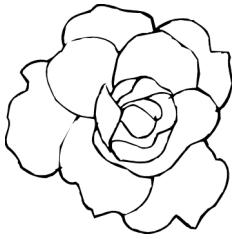
   D. 231,618 specimens

2. At Saturday's football game, four players gained yards carrying the ball. James gained 77, Brian 73, Deshawn 69, and Stuart 89. To make record-keeping easier, the coach rounds off to the nearest 10 yards. Which yardage would be rounded to 80?

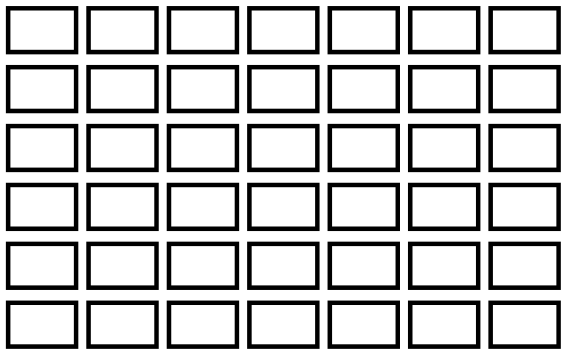
   A. 77 yd **B.** 73 yd

   C. 69 yd **D.** 89 yd

3. Rhonda makes tissue paper flowers to decorate her room. She has 42 pieces of tissue paper. Each flower requires 6 pieces of tissue paper.



paper flower



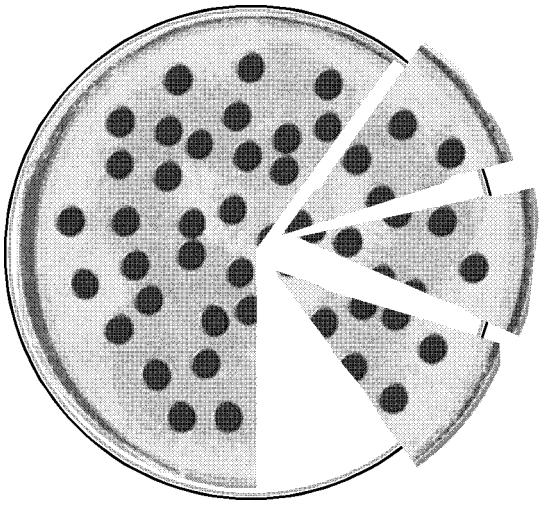
tissue paper pieces

Draw lines around equal groups of tissue paper pieces to show how many flowers Rhonda can make.

Write a number sentence to describe your model.

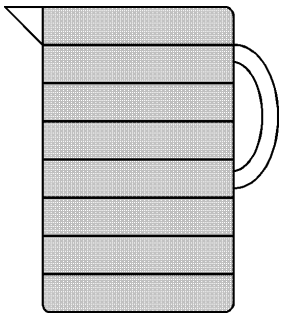
Write another number sentence to check your answer.

4. The picture shows a cut-up pizza. What fraction of the pizza is each slice?

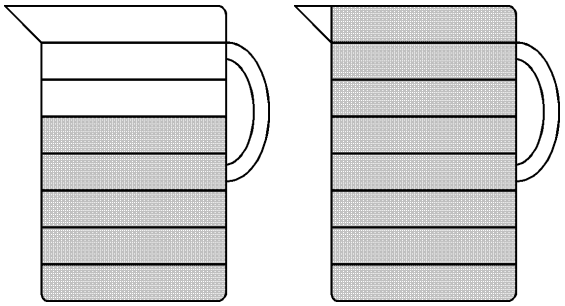


A. $\frac{1}{3}$ **B.** $\frac{1}{6}$ **C.** $\frac{1}{8}$ **D.** $\frac{1}{10}$

5. The drawing shows a full pitcher of juice.

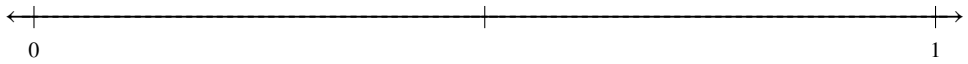


Which number represents how full these two pitchers of juice are when added together?



A. $\frac{3}{8}$ **B.** $1\frac{5}{8}$ **C.** $1\frac{3}{8}$ **D.** $2\frac{5}{8}$

6. Mr. Cunningham attended a conference. He completed one part of the whole conference. The whole conference is two parts. Mr. Cunningham wants to display the information on a number line.



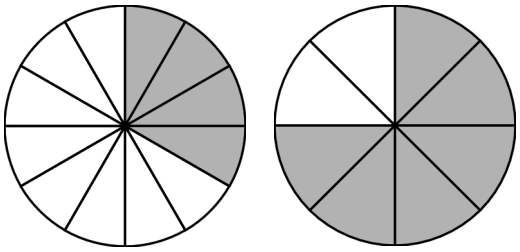
Label the number line.

What is the denominator of the fraction?

Draw a point to show the fractional part Mr. Cunningham completed and label the point R.

How many parts are there?

7. The Pet Zone had 12 birds for sale and 4 of the birds were yellow. The Animal Place had 8 birds for sale and 6 of the birds were yellow. Use the models to decide which store had a greater fraction of yellow birds.



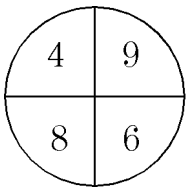
Pet Zone Animal Place

Which store had a greater fraction of yellow birds? _____

8. Stan threw 2 darts at the dartboard. His score was the sum of the two numbers where the darts landed. Which number shows a score that Stan could have made?

A. 9 **B.** 11

C. 15 **D.** 20



9. Which number should go in the box to make the number sentence true?

$263 - 24 - \square = 165$

A. 61 **B.** 74 **C.** 79 **D.** 82

10. A baseball league has 9 teams. The greatest number of players on a team is 18. The least number of players on a team is 14. Which could be the total number of players in the entire league?

A. 155 **B.** 126 **C.** 100 **D.** 77

11. The Wexlers are moving to a new house. There were a total of 580 boxes on the moving truck. On the morning that the truck arrived, the moving company unloaded 212 boxes. That afternoon they unloaded an additional 182 boxes. Which method could be used to find the number of boxes they still need to unload?

A. Add 580 and 212. Then add 182.

B. Subtract 580 from 212. Then subtract 182.

C. Subtract 212 from 580. Then subtract 182.

D. Subtract 212 from 580. Then add 182.

12. Kiley's baby sister is 5 months old. Kiley kept track of the amount of formula her baby sister drank over a two week period.

Baby Formula

Week	Number of Ounces
1	224
2	183

data derived from parents.com

$$\begin{array}{r} 224 \\ -\ 183 \\ \hline \end{array}$$

How much more did Kiley's baby sister drink during Week 2 than Week 1?

13. On Friday, 713 tablet covers were shipped. On Saturday, 188 tablet covers were shipped.

How many tablet covers were shipped on the two days altogether?

14. Each Saturday night at the Bear Lake Campground there is a marshmallow roast. The camp manager bought 123 bags of marshmallows. He placed the bags on top of a picnic table. A group of raccoons carried off 19 bags of marshmallows.

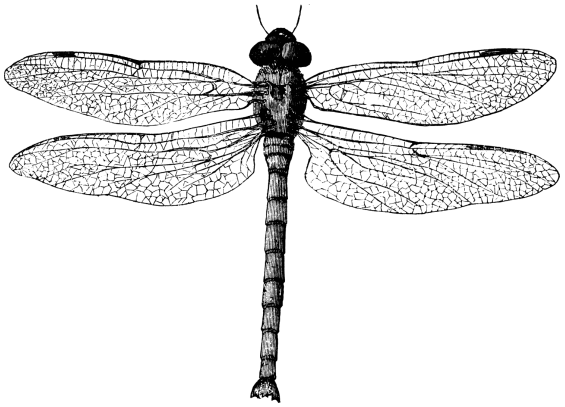
$$\begin{array}{r} 123 \\ -\ 19 \\ \hline \end{array}$$

How many bags of marshmallows are left?

Are you sure?

Write an equation to check your answer.

15. The dragonfly has 4 wings.



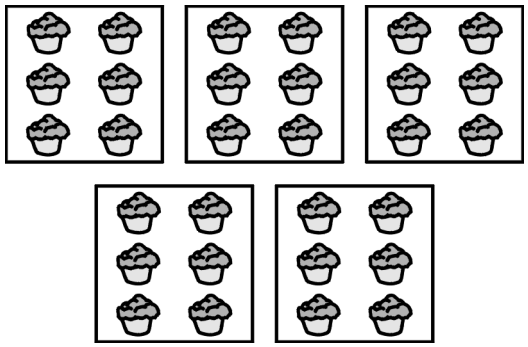
How many wings on 4 dragonflies?

A. 12 wings **B.** 16 wings

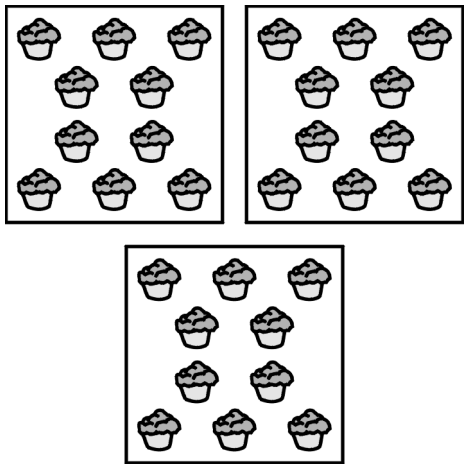
C. 20 wings **D.** 24 wings

16. Marcy baked 30 muffins for the school bake sale. She packaged the muffins to be sold for $3.00 per half dozen. Which of the following represents how she packaged the muffins?

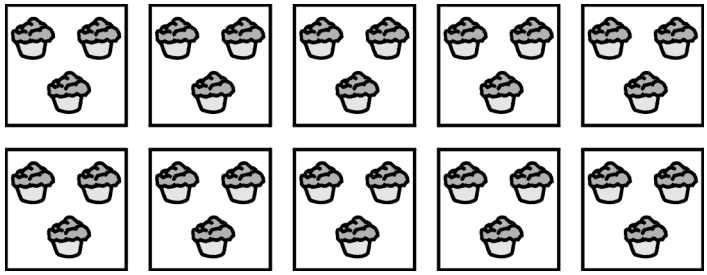
A.



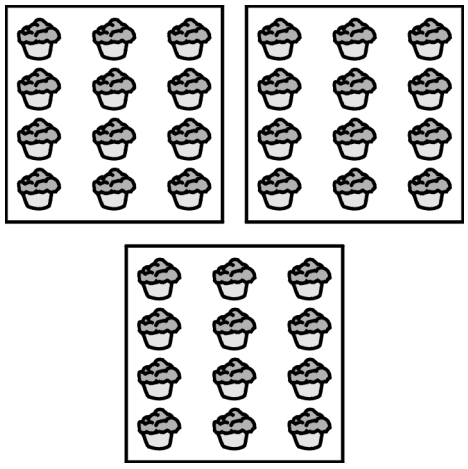
B.



C.



D.



17. Choose the story problem the goes with the number sentence.

$6 \times 2 = 12$

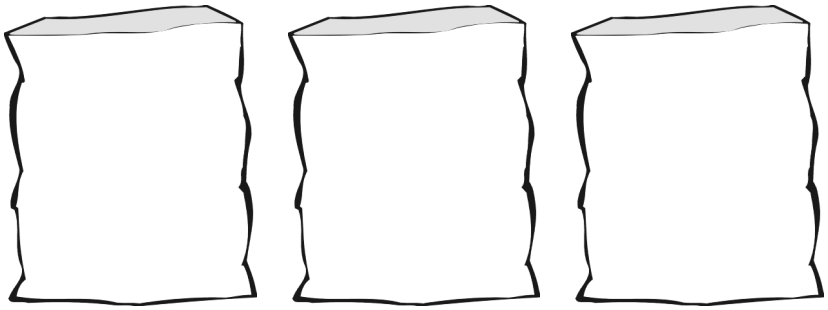
A. Crystal placed 6 pillows on each of the 2 sofas. How many pillows in all?

B. Crystal placed 6 pillows on each of the 6 sofas. How many pillows in all?

C. Crystal placed 2 pillows on each of the 12 sofas. How many pillows in all?

D. Crystal placed 12 pillows on each of the 6 sofas. How many pillows in all?

18. John has 15 cookies. He is going to put an equal number in each bag.



Bag 1 **Bag 2** **Bag 3**

- How many cookies? _____
- How many bags? _____
- How many cookies will be in each bag? _____

19. Tamia earned 85¢ for raking leaves. She spent 36¢ and saved the rest. How much did Tamia save?

A. 

B. 

C. 

D. 

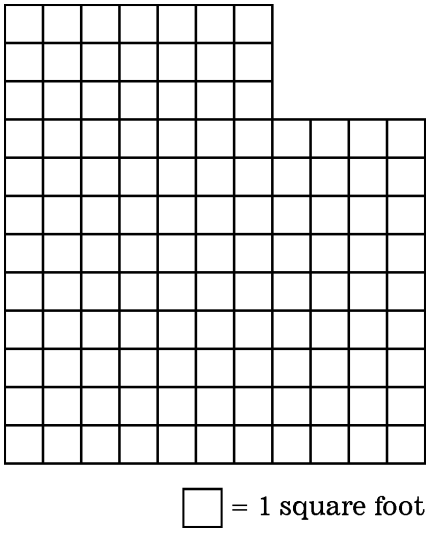
20. Mrs. Malone measured the perimeter of a large rectangular floor pillow she had so that she could buy some lace to put around it. Mrs. Malone's pillow had a perimeter of 14 ft.

If the length of the pillow is 4 feet, what is the width of the pillow?

A. 3 feet **B.** 5 feet

C. 10 feet **D.** 36 feet

21. Austin just moved into a new house. His new bedroom looks like this.



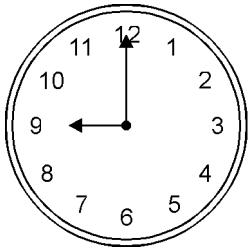
What is the area of Austin's bedroom?

A. 46 square feet **B.** 115 square feet

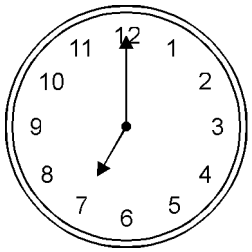
C. 120 square feet **D.** 132 square feet

22. Vicki likes to watch her favorite television show every Saturday at 8:00. Her show ends 1 hour later. Which clock shows the time her show is over?

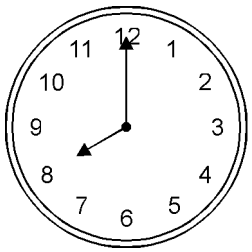
A.



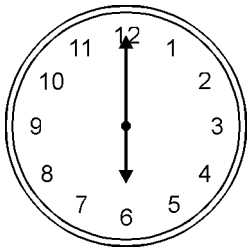
B.



C.



D.

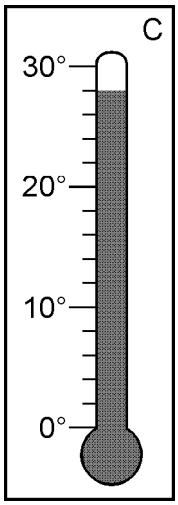


23. Ms. Freeman works at a part-time job from 9:00 am to 2:00 pm. How many hours is Ms. Freeman at work?

A. 5 hours **B.** 6 hours

C. 7 hours **D.** 8 hours

24. Jezreel looked at the following thermometer to see if he needed a jacket. What temperature did he read?



A. 24° **B.** 28° **C.** 30° **D.** 32°

25. Which of the solids named below has the same number of edges as a cube has vertices?

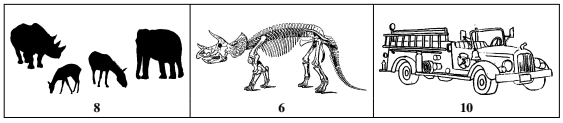
A. triangular prism

B. square pyramid

C. cylinder

D. rectangular prism

26. Mr. White's class is deciding where to go on a field trip. Eight students prefer the zoo. Six students prefer the science museum. Ten students prefer the fire station. Which tally chart shows these results?



A.

Field Trip

Zoo	𝍸 𝍸
Science Museum	𝍸 |||
Fire Station	𝍸 |

B.

Field Trip

Zoo	𝍸 |||
Science Museum	𝍸 𝍸
Fire Station	𝍸 |

C.

Field Trip

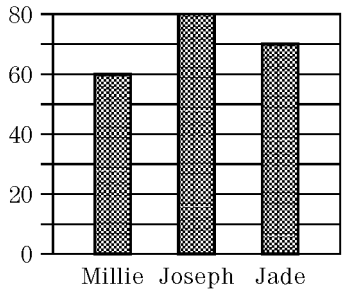
Zoo	𝍸 |||
Science Museum	𝍸 |
Fire Station	𝍸 𝍸

D.

Field Trip

Zoo	𝍸 𝍸
Science Museum	𝍸 |
Fire Station	𝍸 |||

27. Shawna is in the fourth grade. She made a graph about 3 of her classmates, but she forgot to label the graph. Which is a reasonable description of the graph?



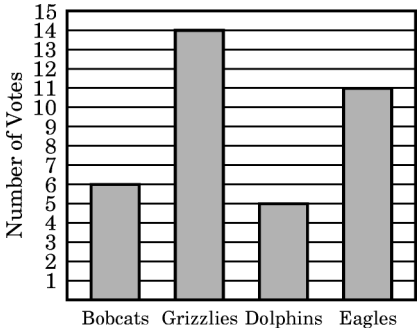
A. The ages of her classmates

B. The number of pets each of her classmates owns

C. The weights in pounds of her classmates

D. The heights in inches of her classmates

28. The graph shows the number of votes for a class mascot.

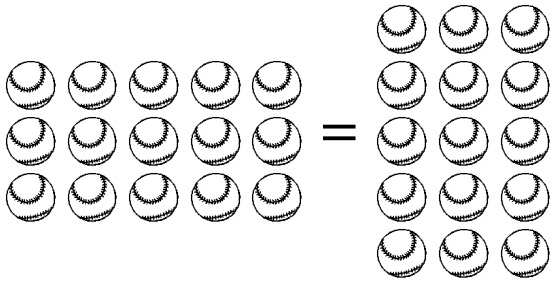


How many more votes for Grizzlies than for Dolphins?

How many votes in all?

Sterling said there were more votes for Eagles than Bobcats and Dolphins together. Is he right? Explain or show your thinking.

29.



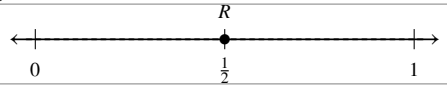
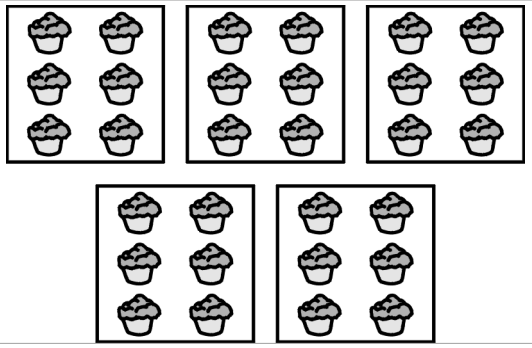
Write an equation for the diagram above using the commutative property.

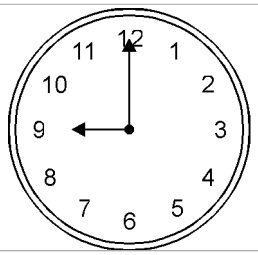
A. $3 \times 5 = 3 \times 5$ **B.** $3 \times 3 = 5 \times 5$

C. $3 \times 5 = 5 \times 3$ **D.** $5 \times 5 = 3 \times 3$

Problem-Attic Sample Document
all items from Virginia SOL Math Database

Grade 3

Num	Scoring	Standard	Answer
1	D	3.01A	231,618 specimens
2	A	3.01B	77 yd
3		3.02	$42 \div 6 = 7$; $6 \times 7 = 42$
4	D	3.03A	$\frac{1}{10}$
5	B	3.03A	$1\frac{5}{8}$
6		3.03B	2; 
7		3.03C	Animal Place
8	C	3.04	15
9	B	3.04	74
10	A	3.04	155
11	C	3.04	Subtract 212 from 580. Then subtract 182.
12		3.04	41 ounces
13		3.04	901
14		3.04	104 bags of marshmallow are left; yes; $19 + 104 = 123$
15	B	3.06	16 wings
16	A	3.06	
17	A	3.06	Crystal placed 6 pillows on each of the 2 sofas. How many pillows in all?
18		3.06	15, 3, 5
19	A	3.08	
20	A	3.09D	3 feet
21	C	3.10B	120 square feet

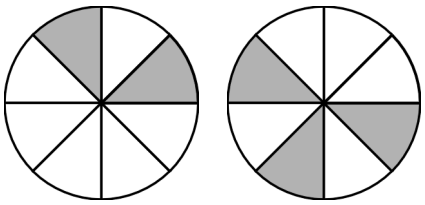
22	A	3.11B	
23	A	3.11B	5 hours
24	B	3.13	28°
25	B	3.14	square pyramid
26	C	3.17A	**Field Trip** Zoo 𝍸 ||| Science Museum 𝍸 | Fire Station 𝍸 𝍸
27	C	3.17B	The weights in pounds of her classmates
28		3.17C	9; 36; No, there were 11 votes for Eagles and 11 votes for Bobcats and Dolphins together.
29	C	3.20A	$3 \times 5 = 5 \times 3$

1. Kerrie bragged that she had read 26,800 pages beyond her summer reading assignments. If she had rounded to the nearest hundred pages what is the smallest number of pages that she read?

A. 26,652 **B.** 26,750

C. 26,802 **D.** 26,850

2.



sausage pizza combo pizza

Sam ate two pieces of sausage pizza, and Carmen ate three pieces of combo pizza, as shown. Which statement is true?

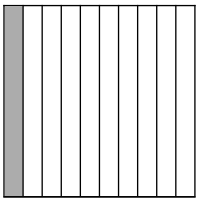
A. Sam and Carmen ate the equivalent of one pizza together.

B. Sam ate half as much pizza as Carmen.

C. Sam ate $\frac{1}{3}$ of a pizza less than Carmen.

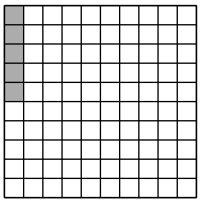
D. Sam ate $\frac{1}{8}$ of a pizza less than Carmen.

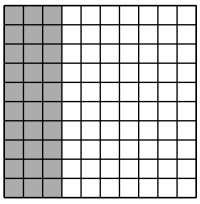
3. Dajuan wrote a fraction to describe the model.

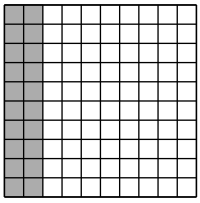


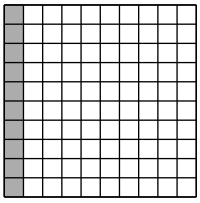
$\frac{1}{10}$

Choose the fraction model that is equivalent to $\frac{1}{10}$.

A. 

B. 

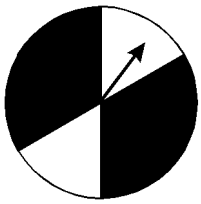
C. 

D. 

4. When a large group was done eating at Patrick's Pizza Parlor, the waiter boxed up all of the leftover slices. Altogether, they formed the equivalent of $4\frac{3}{8}$ full pizzas. If a pizza is always cut into eight slices, how many slices were in the boxes?

A. 12 **B.** 20 **C.** 32 **D.** 35

5. Kim made a spinner like the one shown. Then she gave it many spins and kept track of the color that the arrow landed on.

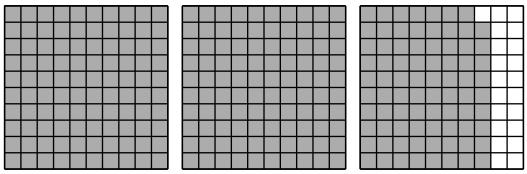


color	spins
white	𝍸 ||||
black	𝍸 𝍸 ||

What fraction of spins did the arrow land on white?

A. $\frac{1}{3}$ **B.** $\frac{4}{7}$ **C.** $\frac{3}{7}$ **D.** $\frac{3}{4}$

6. Which decimal tells how much is shaded?



A. 200.79 **B.** 20.79

C. 20.21 **D.** 2.79

7. What is the value of the underlined digit in the following number?

9.43<u>7</u>

A. seven tenths

B. seven hundredths

C. seven thousandths

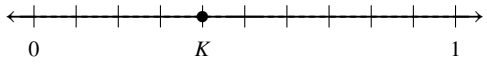
D. seven ten-thousandths

8. The average daily production of cars on the assembly line for August is 145.86. What is the daily production to the nearest unit?

A. 145 **B.** 146

C. 146.9 **D.** 150

9. Which decimal is represented by the point K?



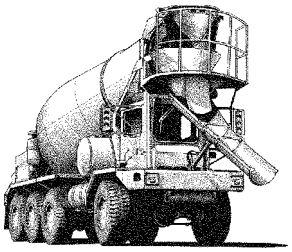
A. $\frac{8}{10}$ because 0.80 is equivalent to $\frac{8}{10}$

B. $\frac{6}{10}$ because 0.60 is equivalent to $\frac{6}{10}$

C. $1\frac{4}{10}$ because 1.40 is equivalent to $1\frac{4}{10}$

D. $\frac{4}{10}$ because 0.40 is equivalent to $\frac{4}{10}$

10. A construction company specializes in cement paving and patching. The company wants to prepare a bid to lay sidewalks and curb ramps in a city.



What should the company do to present a reasonable bid?

A. ask the workers how many hours it will take them to complete the project

B. build a small wooden model of the project, then estimate the materials and labor needed

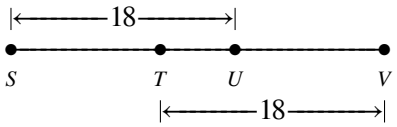
C. determine the amount of materials and labor that was needed on prior similar jobs

D. find out how much the competitors charge for materials

11. Francois has less than 20 dominoes. If they are in rows of 3, none are left over. If they are in rows of 4, two are left over. What is a reasonable number of dominoes?

A. 21 **B.** 18 **C.** 15 **D.** 12

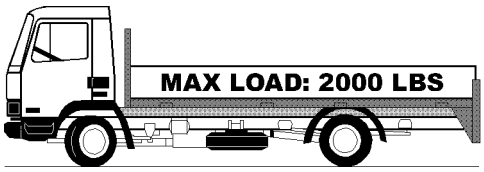
12. Using the given figure, find the length of $\overline{TU}$ if $\overline{SV}$ is 30 units.



A. 6 units **B.** 12 units

C. 14 units **D.** 18 units

13. A truck at a lumber yard has a carrying capacity of 2000 pounds. What is the maximum number of 450-pound logs that the truck can carry at the same time?



A. 3 **B.** 4 **C.** 5 **D.** 6

14. A stockbroker wants to sell 9,023 shares of stock by the end of the week. By the time she leaves the office on Wednesday, she has sold 4,780 shares. How many more shares must she sell to meet her goal?

A. 3,019 **B.** 2,926

C. 4,243 **D.** none of these

15. A club is mailing envelopes weighing 2 ounces each. How much will 300 envelopes weigh?

A. 200 oz **B.** 400 oz

C. 600 oz **D.** 1000 oz

16. Mr. Wrigley is president of the youth baseball league. There are 12 teams in the league and each team has 10 to 15 players. Which is a reasonable number of players that are in the youth baseball league?

A. Between 100 and 120

B. Between 140 and 160

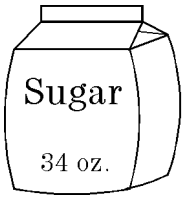
C. Between 180 and 200

D. More than 200

17. If two more balls are shaded, what fraction of the total number of balls will be shaded?

A. $\frac{1}{8}$ **B.** $\frac{1}{4}$ **C.** $\frac{1}{3}$ **D.** $\frac{1}{2}$

18. About how much does this weigh?



A. 1 pound

B. 2 pounds

C. 3 pounds

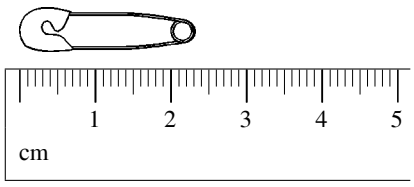
D. 4 pounds

19. A can of chicken noodle soup weighs 425 grams. How many *kilograms* does the can of soup weigh?

A. 425,000 kg **B.** 4,250 kg

C. 4.25 kg **D.** 0.425 kg

20. What is the length of the safety pin in millimeters ?



A. 0.23 mm **B.** 2.3 mm

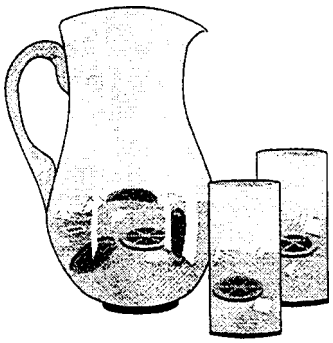
C. 23 mm **D.** 230 mm

21. A folding measuring stick is 10 feet long. If there are 8 folds, how long is each section?

A. 7 in. **B.** 14 in.

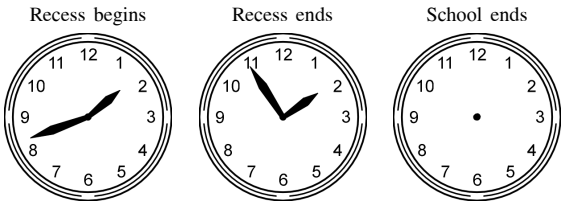
C. 18 in. **D.** 1 ft 3 in.

22. Tony bought 7 pints of lemonade for a class party. José brought one gallon.



Explain who brought more lemonade to the party using liquid measurements, symbols, and mathematical terms.

23. The first clock shows when recess begins and the second clock shows when recess ends.



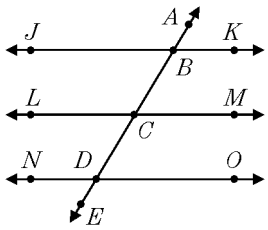
How many minutes long is recess?

The school day ends 1 hour and 20 minutes after recess. At what time does school end? Show your answer on the clock.

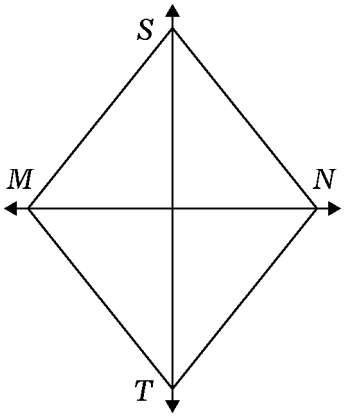
24. How many lines in this picture can be named using the points labeled?

A. 3 **B.** 4

C. 5 **D.** 6



25. Which statement is true about the figure?



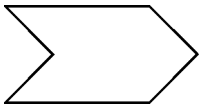
A. The figure has only one line of symmetry.

B. There are no intersecting lines in the figure.

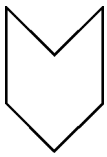
C. Line segments *ST* and *MN* intersect.

D. There are two right angles.

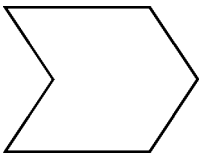
26. Which figure is congruent to the shape below?



A.

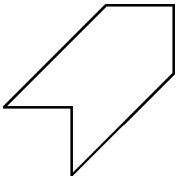


B.



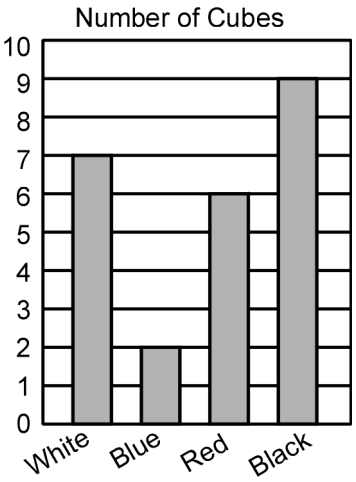
C.

D.



27. Use the information below to answer the following question(s).

There is a bag that only contains white, blue, red, and black cubes. Andres selects a cube and then returns it to the bag. He repeats the process many times. The results are recorded in the bar graph below.



Which color is Andres *most* likely to pick next?

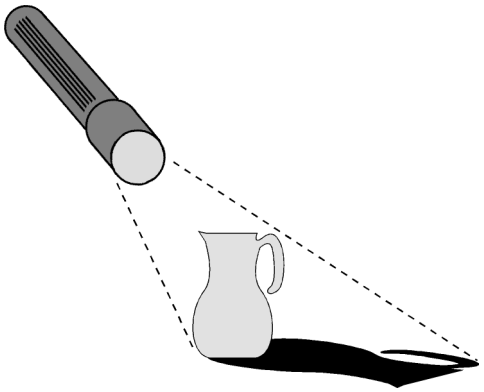
A. white

B. blue

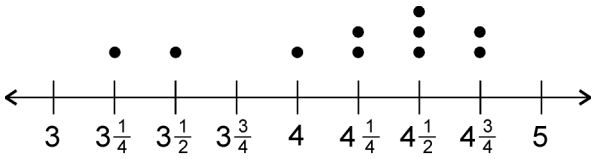
C. red

D. black

28. The artists took turns holding a flashlight near a pitcher as shown in the picture. The artists measured the length of each shadow and recorded the information in a line plot.



Shadow Lengths (inches)



What was the longest shadow measured, in inches?

A. $3\frac{1}{4}$ **B.** $4\frac{1}{4}$ **C.** $4\frac{1}{2}$ **D.** $4\frac{3}{4}$

29. Mrs. Curtis is buying packages of pencils at the store. The table below shows how many pencils are in 3, 5 and 8 packages.

Number of Packages	Number of Pencils
3	30
5	50
8	80

If Mrs. Curtis buys 19 packages of pencils, how many pencils will she have purchased?

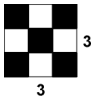
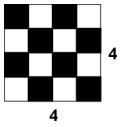
A. 19

B. 190

C. 1,900

D. none of these

30. Complete the following table. Make sure you express the fraction in the lowest terms.

	Length of each side	**Number of small ■'s**	**Fraction of object that is black**	**Fraction of object that is white**
1	1 unit	1	1	0
 2	2 units	4	$\frac{1}{2}$	
 3	3 units			
 4				

What pattern figure is formed as the small ■'s are joined?

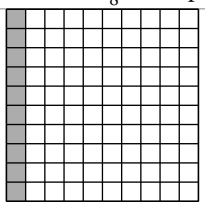
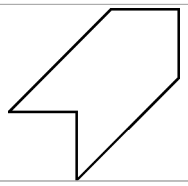
Can other shapes be created by joining the same number of small pieces? Circle your answer.

YES. Then, give an example.

NO. Then, explain why not.

Problem-Attic Sample Document
all items from Virginia SOL Math Database

Grade 4

Num	Scoring	Standard	Answer
1	B	4.01C	26,750
2	D	4.02A	Sam ate $\frac{1}{8}$ of a pizza less than Carmen.
3	D	4.02B	
4	D	4.02B	35
5	C	4.02C	$\frac{3}{7}$
6	D	4.03A	2.79
7	C	4.03A	seven thousandths
8	B	4.03B	146
9	D	4.03D	$\frac{4}{10}$ because 0.40 is equivalent to $\frac{4}{10}$
10	C	4.04A	determine the amount of materials and labor that was needed on prior similar jobs
11	B	4.04A	18
12	A	4.04B	6 units
13	B	4.04C	4
14	C	4.04D	4,243
15	C	4.04D	600 oz
16	B	4.04D	Between 140 and 160
17	D	4.05B	$\frac{1}{2}$
18	B	4.06B	2 pounds
19	D	4.06B	0.425 kg
20	C	4.07A	23 mm
21	D	4.07B	1 ft 3 in.
22		4.08B	Tony; one gallon = 8 pints
23		4.09	≈13 minutes; 3:15; [graph]
24	B	4.10A	4
25	C	4.10B	Line segments *ST* and *MN* intersect.
26	D	4.11A	
27	D	4.13A	black
28	D	4.14	$4\frac{3}{4}$

29	B	4.15	190
30		4.15	[answers vary]

1.	2	3	4	5	9

a) Use **each number** in the box to build two different decimal numbers.

My first decimal number

_____

My second decimal number

_____

b) Use as many of the symbols <, >, =, ≠ as you can to write comparisons of your numbers.

c) Round both of your decimal numbers to the nearest tenth and explain the process. Use decimal models or a number line to show rounding.

d) Use as many of the symbols <, >, =, ≠ as you can to write comparisons of your rounded numbers.

e) How did rounding change your comparisons? Explain.

2. Kathryn has to move an unknown number of identically-sized moving boxes from a warehouse to her retail store. Her fully loaded truck carries 18 boxes exactly. If she made eleven trips with a full load, and carried seven boxes on the twelfth load, how many total boxes did Kathryn move?

A. 95 **B.** 128 **C.** 153 **D.** 205

3. Rachel bought 4 dozen cookies for her club meeting. There are 16 members of her club. Which strategy could be used to determine the number of cookies that each member can have?

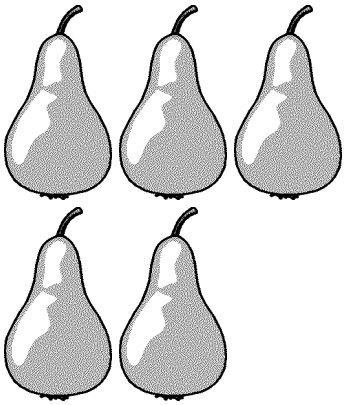
A. Divide 16 by 4

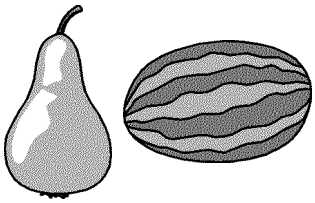
B. Multiply 16 and 4

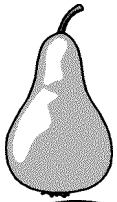
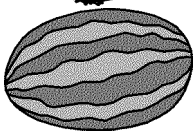
C. Multiply 16 and 4, then divide the result by 12

D. Multiply 4 and 12, then divide by the result by 16

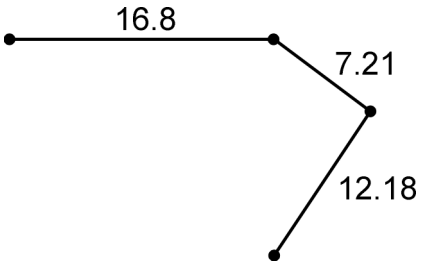
4. Mrs. Owen went to the fruit market and found that



cost the same as 

If  costs 50¢, then what does  cost?

5. The drawing shows a river that connects four cities.



What is the distance of the longest two stretches of the river?

A. 13.86 miles **B.** 19.39 miles

C. 24.1 miles **D.** 28.98 miles

6. For a project, Hope had to weigh 3 rats in the science lab. The first rat weighed 8.7 ounces, the second weighed 10.1 ounces, and the third weighed 9.9 ounces. Which is the best estimate of the combined weights of all 3 rats?

A. 32 oz **B.** 29 oz

C. 20 oz **D.** 10 oz

7. Greg is buying soft drinks for a class party. He discovers that one case of drinks costs \$6.79. However, if he buys 20 or more cases, he will get a 10% discount. A reasonable conclusion about the price for 20 cases is that it would be ____.

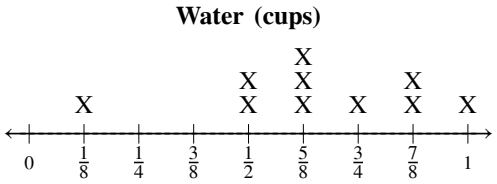
A. more than \$140

B. between \$130 and \$140

C. between \$120 and \$130

D. less than \$110

8. Ten fifth-graders measured different amounts of water into a pitcher. The amounts of water are shown on the line plot.



What is the total amount of water?

A. $5\frac{1}{2}$ cups **B.** $5\frac{3}{4}$ cups

C. $6\frac{1}{4}$ cups **D.** $6\frac{1}{2}$ cups

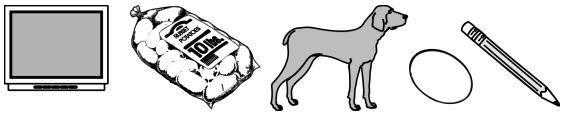
9. Toby needed some string for a tail for his kite. He found $3\frac{3}{4}$ feet of string in his closet, 4 feet in the kitchen, and $9\frac{3}{8}$ feet in the garage. How many feet of sting did he find in all?

A. $16\frac{1}{2}$ **B.** $17\frac{1}{2}$ **C.** $17\frac{3}{4}$

D. none of these

10. Bradley measured different objects using either pounds or ounces. The table below is missing some units that he used to measure the objects.

Item	Weight	Unit
Television	15	pounds
Sack of potatoes	5	?
Dog	30	?
Egg	4	?
Pencil	3	?



Which objects should include pounds as the unit of measurement?

A. The Egg and Dog

B. The Pencil and Dog

C. The Pencil and Potatoes

D. The Dog and Potatoes

11. A unit cube can measure the—

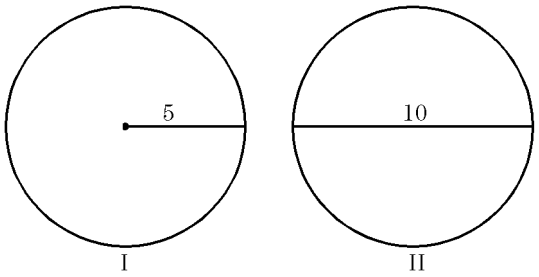
A. height of a tree

B. space inside a cardboard box

C. distance from school to home

D. area of the kitchen floor

12. Which circle has a greater circumference, one with a diameter of 10 or one with a radius of 5?



A. I

B. II

C. they are the same

D. not enough information to tell

13. Tommy did his homework in 1 hr 52 min. Megan did her homework in 145 min. How much less time did Tommy spend on his homework?

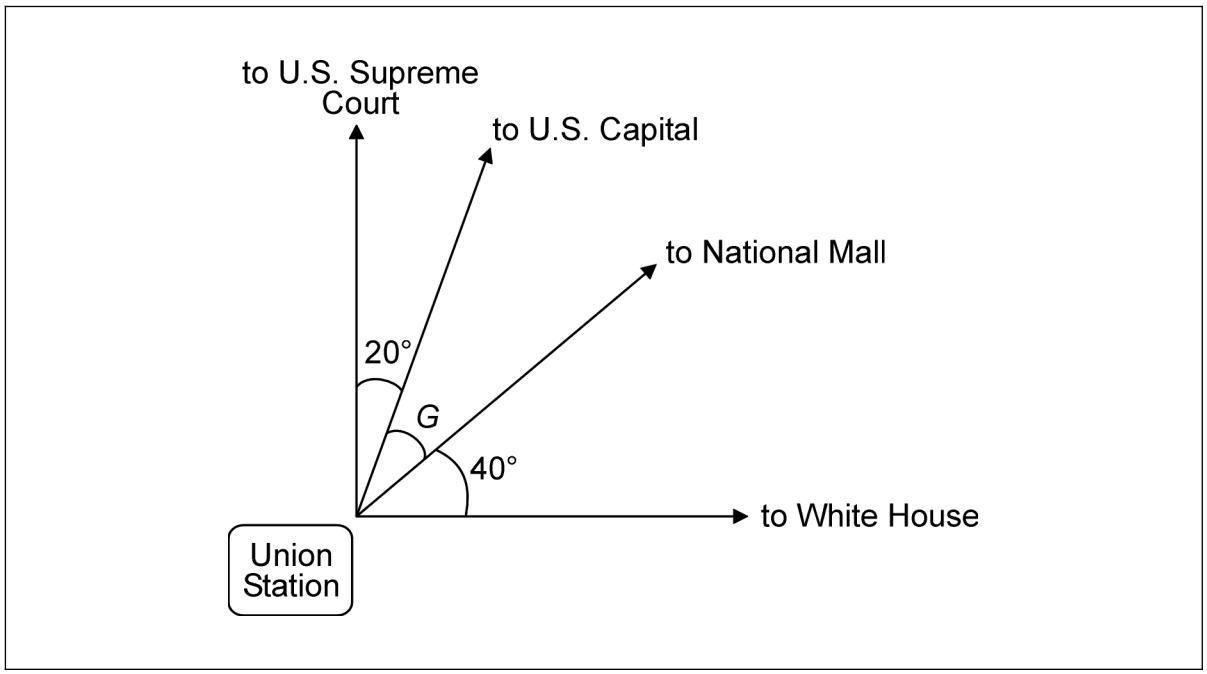
A. 133 min

B. 60 min

C. 33 min

D. 23 min

14. The drawing shows four streets that connect at Union Station in Washington, D.C.

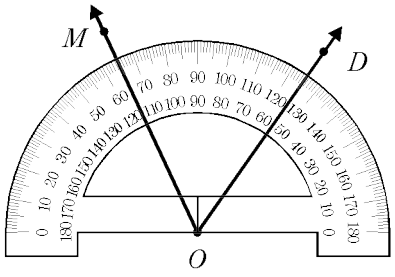


adapted from Google map

What is the measure of Angle G?

A. 20° **B.** 30° **C.** 40° **D.** 120°

15. Find the measure of $\angle MOD$.



A. 60° **B.** 65° **C.** 75° **D.** 125°

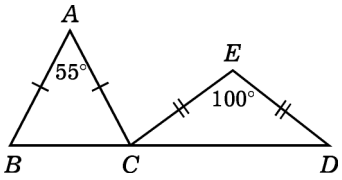
16. In the diagram, what is the measure of $\angle ACE$?

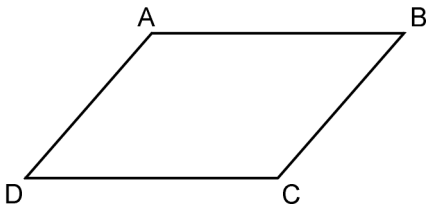
A. 77.5°

B. 95°

C. 102.5°

D. 142.5°



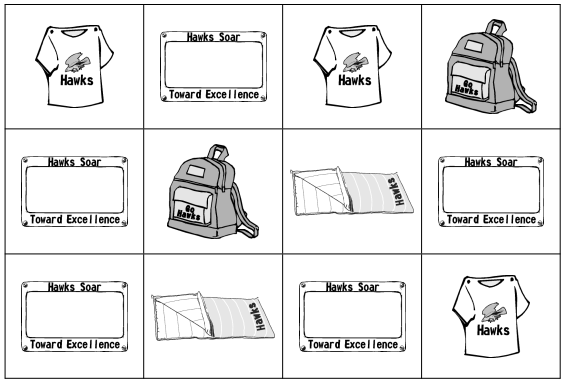
17. 

a) The figure above is a parallelogram. Draw two line segments inside of it to create the largest possible rectangle.

b) How many triangles were created when you added the two line segments? What kind of triangles are they?

c) Label the points of intersection with letters. How many pairs of parallel lines are in the figure? Name them.

18. Each semester, the seventh graders with a GPA of 3.0 or better, get a chance to win school spirit prizes by choosing a card at random. On each card is displayed a school spirit prize. If Jill chooses a card at random, what is the probability that she will win a back pack or a license plate frame?



A. $\frac{3}{12}$ **B.** $\frac{5}{12}$ **C.** $\frac{7}{12}$ **D.** $\frac{9}{12}$

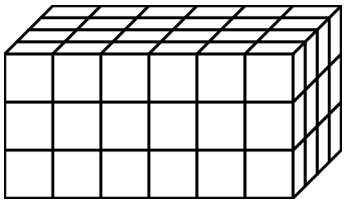
19. The box shows Lakeisha's scores on five math quizzes.

100	89	84	72	95

What is Lakeisha's median quiz score?

A. 72 **B.** 84 **C.** 89 **D.** 95

20. Blake made a jewelry box for his mother. He modeled its dimensions using the rectangular prism below.



The rectangular prism is made out of 1-inch cubes. What is the volume of Blake's jewelry box?

A. 50 cubic centimeters

B. 60 cubic centimeters

C. 72 cubic centimeters

D. 80 cubic centimeters

21. On a cold winter day, Mrs. Taylor and Mr. Zakir offered hot chocolate to the ski team. They prepared 36 mugs of hot chocolate. During the day, they drank 2 mugs and distributed 28 mugs to the team. Which expression can be used to find how many mugs of hot chocolate they had left over?

A. $(36 - 28) + (36 - 2)$

B. $36 + 2 + 28$

C. $36 - 2 - 28$

D. $36 - 2 + 28$

22. "Monica had 24 dollars and Dianne had 16 dollars. How many pennies did they have altogether?"

What would be the *best* way to solve this problem?

A. $(24 + 16) \times 100$

B. $(24 + 16) + 100$

C. $(24 \times 16) - 100$

D. $100 + (24 + 16)$

23. Mr. Williams measured a rug and found it was 6 feet long and 2 feet wide. To find the area, he used the equation $6 \times 2 = 12$.

4×2 2×2

Which of these is another way to find the area of the rug?

A. $(4 \times 4) + (2 \times 2) = 20$

B. $(4 \times 1) + (2 \times 1) = 6$

C. $(4 \times 2) + (2 \times 2) = 12$

D. $(4 \times 2) + (4 \times 2) = 16$

Problem-Attic Sample Document
all items from Virginia SOL Math Database

Grade 5

Num	Scoring	Standard	Answer
1		5.01	[answers vary]
2	D	5.04	205
3	D	5.04	Multiply 4 and 12, then divide by the result by 16
4		5.04	$2.00
5	D	5.05B	28.98 miles
6	B	5.05B	29 oz
7	C	5.05B	between $120 and $130
8	D	5.06	$6\frac{1}{2}$ cups
9	D	5.06	none of these
10	D	5.08E	The Dog and Potatoes
11	B	5.08E	space inside a cardboard box
12	C	5.09	they are the same
13	C	5.10	33 min
14	B	5.11	30°
15	A	5.11	60°
16	A	5.13A	77.5°
17		5.13A	[task]; 2, right; 4 pairs of parallel lines
18	C	5.14	$\frac{7}{12}$
19	C	5.16C	89
20	C	5.08A	72 cubic centimeters
21	C	5.17	$36 - 2 - 28$
22	A	5.17	$(24 + 16) \times 100$
23	C	5.19	$(4 \times 2) + (2 \times 2) = 12$

Virginia Math Samples — Grade 6

1. John buys a car that gets 30 miles to a gallon of gasoline. If he has a fifteen gallon gas tank, how many miles can he go on a tank of gas?

Gallons of gas	3	6	9	12	15	18
Miles	90	180	270	360	?	540

A. 390 **B.** 420 **C.** 450 **D.** 480

2. One of the most popular items at a bakery is Cranberry Nut Bread. To make the bread, the bakery has on hand $8\frac{3}{4}$ pounds of walnuts and $10\frac{1}{2}$ pounds of fresh cranberries. What is the ratio of walnuts to cranberries?

A. 5 : 6 **B.** 5 : 4

C. 42 : 35 **D.** 56 : 42

3. Each table in a restaurant is equipped with a turntable. One table has a turntable with a diameter of 30 inches. A different table has a turntable with a diameter of 10 inches. How much farther does a plate of food travel in one revolution of the larger turntable than in one revolution of the smaller turntable?

A. 30 times farther **B.** 20 times farther

C. 5 times farther **D.** 3 times farther

4. Students in a biology class found the ratio of red blood cells to white blood cells to be 6 to 1 for a certain organism. If the number of white cells counted was 150, how many red cells were present?

A. 900 **B.** 120 **C.** 50 **D.** 25

5. A large box holds 50 tangerines, and a small box holds 25 tangerines. Arlo loaded into his truck 36 small and 6 large boxes filled with tangerines. What percent of all the tangerines were in small boxes?

A. 40% **B.** 75%

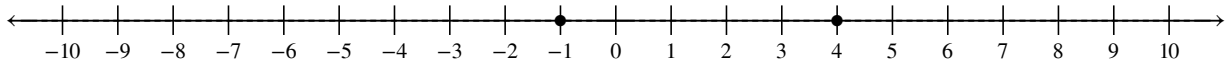
C. 90% **D.** none of these

6. A survey of 375 people revealed that $\frac{1}{5}$ of them chose pecan pie as their favorite dessert. To find the number of people who chose pecan pie as their favorite, multiply 375 by ____.

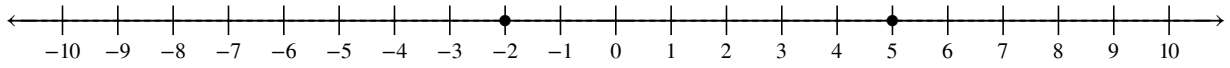
A. 0.02 **B.** 0.05 **C.** 0.2 **D.** 2.0

7. Which of the number lines show opposite numbers?

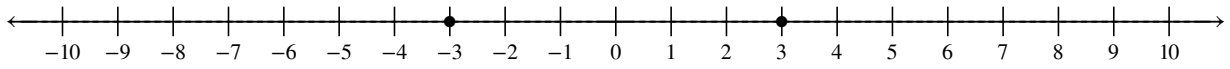
A.



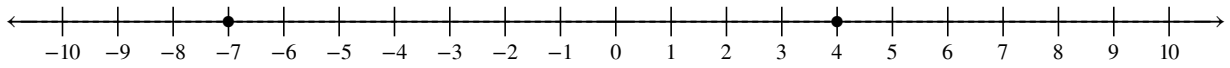
B.



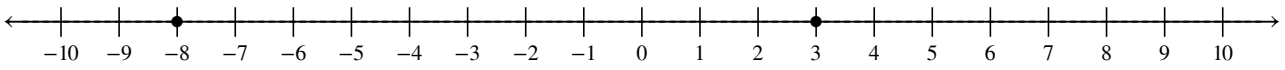
C.



D.



8. $3 \square -8$



Which symbol correctly compares the numbers?

A. ÷ **B.** = **C.** > **D.** <

9. Stacy determined the height above her office building of several surrounding downtown buildings. Which list has this data displayed from least to greatest?

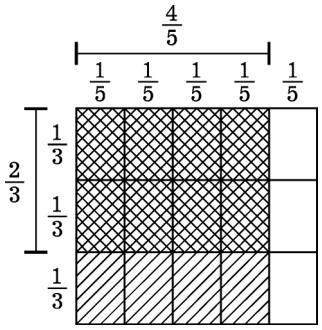
A. 51 m, 32 m, 8 m, −29 m, −11 m

B. 51 m, 32 m, 8 m, −11 m, −29 m

C. −29 m, −11 m, 8 m, 32 m, 51 m

D. −11 m, −29 m, 8 m, 32 m, 51 m

10. Mr. Robbins will re-finish some of the wood floor in the den. He makes a drawing to determine the area of the floor to re-finish.



Mr. Robbins shaded $\frac{2}{3}$ of $\frac{4}{5}$ and got the same result as if he were to—

A. add $\frac{2}{3} + \frac{4}{5}$

B. multiply $\frac{2}{3} \times \frac{4}{5}$

C. multiply $\frac{2}{3} \times \frac{2}{3}$

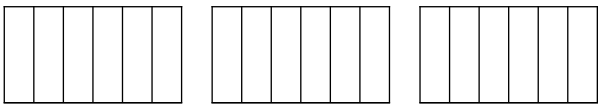
D. multiply $\frac{1}{3} \times \frac{4}{5}$

11. Mr. Blank has 6 bars of chocolate. He will use $\frac{1}{3}$ bar chocolate to make each s'more.

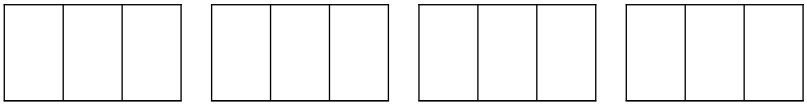
$6 \div \frac{1}{3} = \square$

Which shows how many s'mores Mr. Blank can make from the chocolate bars?

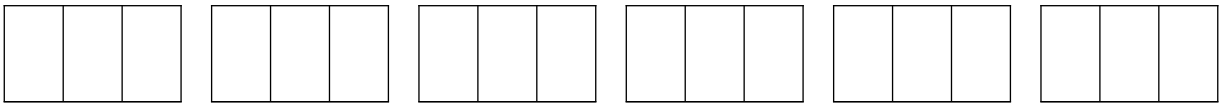
A.



B.



C.



D.

12. If n is a positive number, what happens when n is divided by $\frac{2}{3}$?

A. n becomes an odd number

B. n is reduced by about 33%

C. n is one-third as large

D. n is one-and-a-half times larger

13. Which expression could be used to solve the following problem?

Kim is cutting ribbon to make bows. Each bow requires $\frac{1}{4}$ yd of ribbon. If Kim has $3\frac{1}{2}$ yd of ribbon, how many bows can she make?

A. $\frac{7}{2} \div \frac{1}{4}$

B. $\frac{1}{4} \div 3\frac{1}{2}$

C. $\frac{7}{2} \cdot \frac{1}{4}$

D. $\frac{1}{4} \cdot 3\frac{1}{2}$

14. One day, 60 passports were processed. The passports represent $\frac{1}{5}$ total passports for the week.

$$60 \div \frac{1}{5} =$$

How many passports in one week?

A. 12 **B.** 55 **C.** 110 **D.** 300

15. The sole of a high performance tennis shoe is made of a bottom layer of stiff rubber that is 2.37 mm thick, a foam layer 5.23 mm thick, a nylon mesh stiffener that is 0.86 mm thick, and a top rubber layer that is 1.89 mm thick. How thick is the entire sole of this tennis shoe?

A. 11.35 mm **B.** 10.35 mm

C. 9.35 mm **D.** none of these

16. Anthony spent $157.56 on three items at the local nursery. If he spent $93.25 on plants and $45.67 on tools, what did he spend on the third item, fertilizer?

A. $18.64 **B.** $15.24

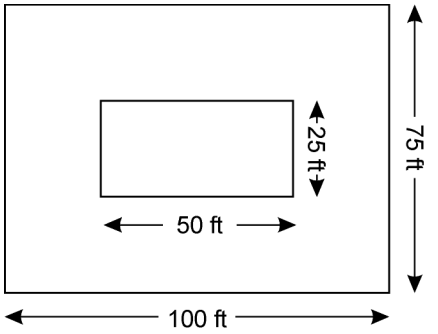
C. $14.14 **D.** none of these

17. Amy just put new tires on her car. If the wheels have a diameter of 28 inches, how far does the wheel travel in 2 revolutions? [Use $\pi \approx \frac{22}{7}$]

A. 616 in. **B.** 440 in.

C. 176 in. **D.** 132 in.

18. A building contractor fenced the construction area. Inside the construction area is a smaller section for equipment storage.



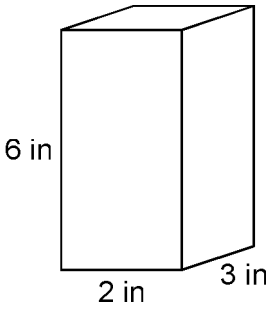
a) What is the perimeter of the construction area?

b) What is the perimeter of the equipment storage?

c) How much total fencing does the contractor need to buy to fence all around both areas?

d) What is the area of the equipment storage? What fraction of the total construction area is this?

19. For a recipe he was making, Mr. Raski set aside 28 one-inch cubes of cheese into a container. The container has a total volume equal to the box shown below.



How many *more* one-inch cubes of cheese can Mr. Raski place inside the container?

A. 40 more **B.** 8 more

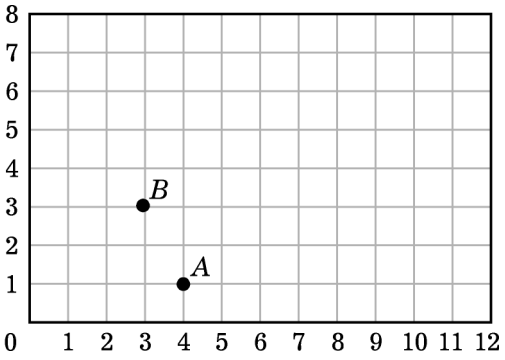
C. 10 more **D.** 14 more

20. A rectangular bathtub measures 72 inches long, 30 inches wide, and 24 inches deep. If each cubic foot of water is equal to about $7\frac{1}{2}$ gallons, how many gallons of water will fit in the tub?

A. $162\frac{1}{2}$ gallons **B.** 225 gallons

C. $384\frac{1}{2}$ gallons **D.** 400 gallons

21. Belinda plays trombone in a marching band. The grid below represents a football field, where she has to march into different positions.



Belinda writes down instructions like this in her sheet music:

move 2U-1L

The numbers tell her how far to march and the letters tell her the direction: Left, Right, Up or Down. For example, after following the instruction above, Belinda goes from point *A* to point *B* on the grid.

Belinda is now at point *B*. If she is given the following instructions, where will she end up on the grid?

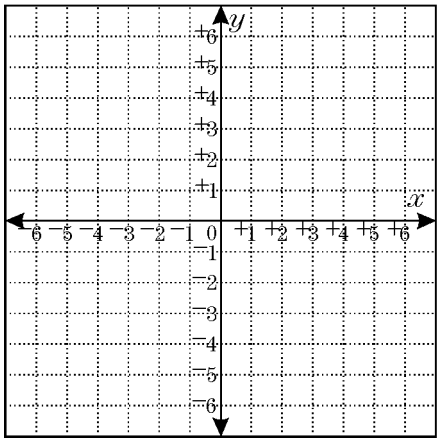
move U1-R4-D3-R3-U4

A. (3, 11) **B.** (5, 10)

C. (10, 5) **D.** (9, 6)

22. What shape is made if you graph these points on a coordinate graph and connect the points?

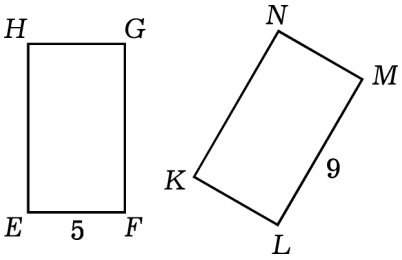
(4, 1), (3, −4), (−3, −4), (−4, 1)



A. square **B.** rhombus

C. trapezoid **D.** rectangle

23. Rectangle *EFGH* is congruent to rectangle *KLMN*. Which statement is *not* true?



A. $EH = 9$

B. $MN = 5$

C. $EG < KM$

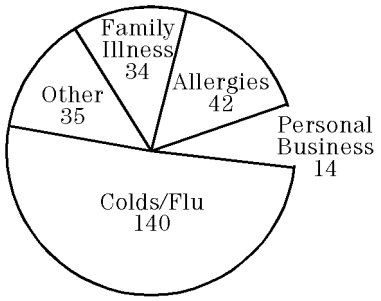
D. Perimeter of $EFGH = 28$

24. How far is the point (−3, −8) from the point (9, −8)?

A. −6 **B.** 11 **C.** 12 **D.** 16

25. The causes for employee absences at one corporation are shown in the chart.

EMPLOYEE ABSENCES



Approximately what percent of the employee absences was due to allergies?

A. 10% **B.** 16% **C.** 18% **D.** 20%

26. Susie was shopping for a computer. If she eliminates the highest price, how does that effect the measures of central tendency of the data?

Computer Prices	
Store	Price
A	$899.99
B	$1,004.98
C	$1,036.34
D	$979.99
E	$1,300.99

A. It increases the mean.

B. It decreases the median.

C. It changes the mode.

D. It has no effect on the measures of central tendency.

27. A group of five workers received the following incomes last year:

$23,000 $25,000 $48,000 $22,500 $24,000

The lowest-paid workers want to negotiate a pay raise. What measure of central tendency would be most favorable to them in the negotiation?

A. the mode

B. the mean

C. the median

D. The values are so similar that it does not matter which they use.

28. Which of the following are considered dependent events?

A. Choosing pancakes for breakfast, and a salad for lunch.

B. Taking a cookie from a box, eating it, and taking another cookie.

C. Tossing a coin and throwing a die.

D. Drawing a marble from a bag, replacing it, and drawing another one.

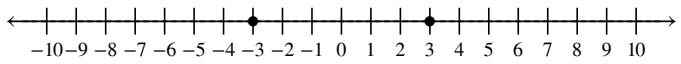
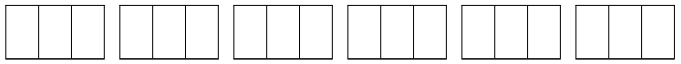
29. Solve: $3x = 45$

A. 135 **B.** 42 **C.** 15 **D.** $\frac{1}{15}$

30. From last night to this morning the temperature rose 12°F. The temperature this morning was 63°F. Let l equal the temperature last night. Write and solve an equation for the temperature last night.

Problem-Attic Sample Document
all items from Virginia SOL Math Database

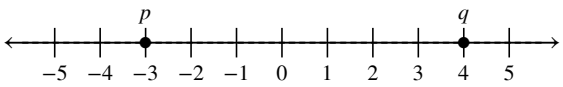
Grade 6

Num	Scoring	Standard	Answer
1	C	6.01	450
2	A	6.01	5 : 6
3	D	6.01	3 times farther
4	A	6.01	900
5	B	6.02B	75%
6	C	6.02C	0.2
7	C	6.03A	
8	C	6.03B	>
9	C	6.03B	−29 m, −11 m, 8 m, 32 m, 51 m
10	B	6.04	multiply $\frac{2}{3} \times \frac{4}{5}$
11	C	6.04	
12	D	6.06A	n is one-and-a-half times larger
13	A	6.04	$\frac{7}{2} \div \frac{1}{4}$
14	D	6.06B	300
15	B	6.07	10.35 mm
16	A	6.07	$18.64
17	C	6.10B	176 in.
18		6.10C	350 ft; 150 ft; 500 ft; 1250 ft^2, $\frac{1}{6}$
19	B	6.10D	8 more
20	B	6.10D	225 gallons
21	C	6.11A	(10, 5)
22	C	6.12	trapezoid
23	C	6.12	$EG < KM$
24	C	6.12	12
25	B	6.14B	16%
26	B	6.15B	It decreases the median.
27	C	6.15B	the median
28	B	6.16A	Taking a cookie from a box, eating it, and taking another cookie.
29	C	6.18	15
30		6.18	51° F

1. A calculator displays the following number in scientific notation. What is the number?

   5.3263 02

2. On the given number line, what is the distance between points p and q?



   A. −12 units **B.** −7 units

   C. 1 unit **D.** 7 units

3. Gabe signed up for a lacrosse summer camp that cost $580.00 but did not pay for it at the time. Over the next several months he earned money at a part-time job and made the $580.00 payment.

   Which of these describes the net change in Gabe's finances?

   A. $-580 - 580 = -1160$

   B. $580 + 580 = 1160$

   C. $-580 + 580 = 0$

   D. $0 - 580 = -580$

4. Point P represents a negative number on a number line. Point Q represents the same number multiplied by −2. Which statement is always true about P and Q?

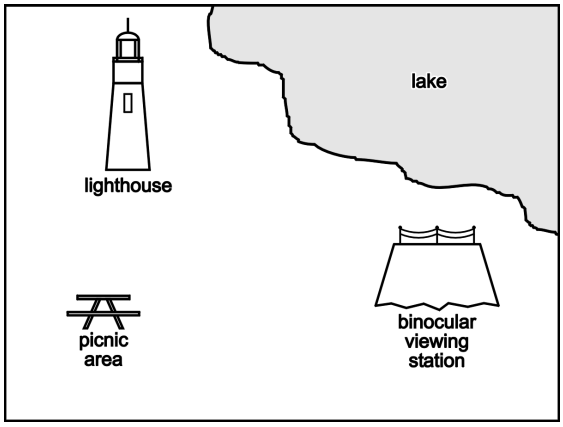
   A. P and Q are 3 units apart.

   B. P is closer to zero than Q.

   C. Q represents a negative number.

   D. P represents a larger number than Q.

5. Look at the map in the picture below.



   On the map, 2 cm equals 1 m. The distance between the picnic area and the binocular viewing station is 6.8 cm on the map. What is the actual distance from the picnic area to the binocular viewing station?

   A. 13.6 meters **B.** 12.6 meters

   C. 3.4 meters **D.** 12.4 meters

6. Professor Dumble is siphoning a liquid from a large container into a smaller jar that can hold 15 liters. There is about 1.06 quarts in one liter. The smaller jar is completely full. How many quarts are there in the smaller jar?

A. 15.02 quarts **B.** 17.01 quarts

C. 18.1 quarts **D.** 15.9 quarts

7. Find the proportion that solves this problem: A 12 oz tube of toothpaste costs $3.95. At the same rate, how much would a 9 oz tube cost?

A. $\frac{12}{3.95} = \frac{x}{9}$ **B.** $\frac{12}{9} = \frac{x}{3.95}$

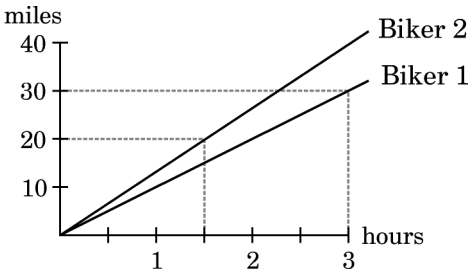
C. $\frac{12}{3.95} = \frac{9}{x}$ **D.** $\frac{3.95}{12} = \frac{9}{x}$

8. Kolby received a repair bill for his boat of $616. The bill included $217 for parts, $39 for miscellaneous charges, and the rest for 8 hours of labor. What was the hourly labor rate?

A. $45 per hour **B.** $69 per hour

C. $77 per hour **D.** $82 per hour

9. The graph shows the distances covered by two bikers. Which biker is going faster and by how much? Explain how you arrived at your answer.

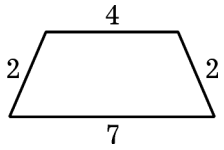


10. A worker wishes to paint the outside of a cabinet. The cabinet measures 2 feet by 7 feet by 4 feet. If he wishes to paint all sides of the cabinet, what is the area of the region to be painted?

A. 13 ft^2 **B.** 100 ft^2

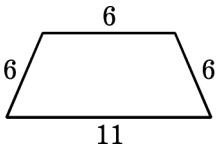
C. 316 ft^2 **D.** 784 ft^2

11. Pauline drew this figure:

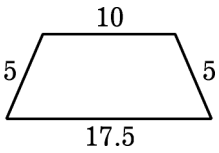


The figures below are *not* drawn to scale. Based on the given information, which is similar to the figure drawn by Pauline?

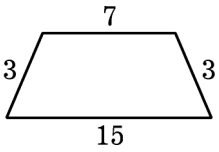
A.



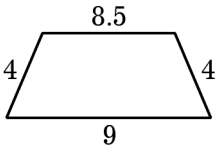
B.



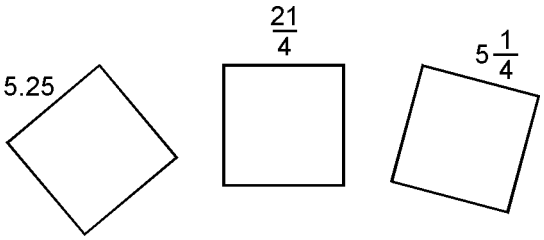
C.



D.



12. Look at the following squares.



Which statement about the squares is true?

A. They are all similar but none are congruent.

B. They are all congruent but none are similar.

C. They are all congruent and similar.

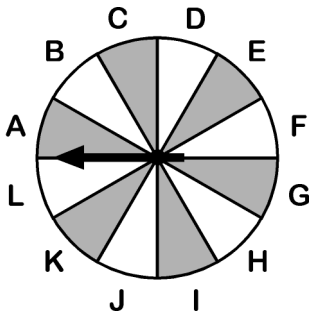
D. They are not similar because their sides are not the same.

13. A spinner is divided into twelve lettered sections, as shown. (Assume the arrow never lands on a dividing line.)

With just one spin, what is the probability of landing on a vowel and a shaded region?

A. $\frac{1}{4}$ **B.** $\frac{1}{2}$

C. $\frac{5}{8}$ **D.** $\frac{3}{4}$



14. Which of the following cannot be considered a probability of an experiment?

A. 1 **B.** 150%

C. 0.95 **D.** 0

15. Pete has a 0.320 batting average. What is the probability of his getting a hit in his next at-bat?

A. 64% **B.** 32% **C.** 30% **D.** 15%

16. Mr. Jackson plans fishing trips for tourists. To predict the kinds of fish that tourists may catch, he needs an estimate of the number of fish in the lake. Mr. Jackson asked his daughter Julia for help.

a) They caught 6 trout, 9 bass and 4 catfish. They tagged and released the fish. Later on, they caught 60 fish. Five of the fish in the second catch had tags. About how many fish are in the lake?

b) If you go fishing in this lake, what is the probability that the first fish you catch will be a bass?

c) Assume the ratio of trout to bass to catfish in the lake is the same as in the first catch. How many of each type of fish are there likely to be in the lake?

17. Rex is to make the sandwiches at the school picnic. Each sandwich contains one meat, one cheese, one condiment, and one vegetable. How many different sandwiches could Rex make?

Meat	Cheese	Condiment	Vegetable
Turkey	American	Mayonnaise	Lettuce
Ham	Swiss	Mustard	Sprouts
Pastrami	Jack		
Roast Beef			

A. 96 **B.** 60 **C.** 48 **D.** 24

18. $\dfrac{9x^3y^8z}{7x^9y^2z^4}$ is best described as a(n):

A. variable **B.** coefficient

C. expression **D.** constant

19. If n represents a number, what is an algebraic expression for "the product of a number and (-5)"?

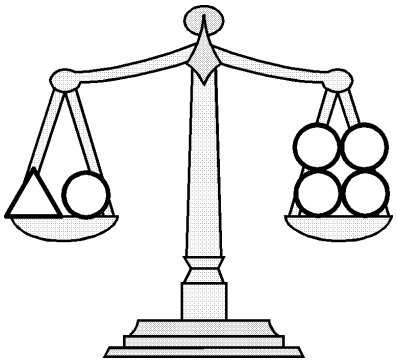
A. $-\dfrac{5}{n}$ **B.** $(-5)+n$

C. $-n(-5)$ **D.** $-5n$

20. Salvatore is the coach for a Little League baseball team. He wants to take the team to watch a major league game. If the admission charge is \$12.50 per adult and \$8 per child, which expression could help Salvatore determine how much it would cost to take one adult (himself) and n members of his team?

A. $12.5 \times 8 \times n$ **B.** $\frac{12.5 + 8}{n}$

C. $12.5 + 8n$ **D.** $12.5n + 8$

21. 

If ◯ = 4, what is the value of △ ?

A. 3 **B.** 4 **C.** 9 **D.** 12

22. Evaluate: $f - (fg + gh)$ when $f = 8$, $g = -1$, and $h = 2$

A. -2 **B.** 2 **C.** 14 **D.** 18

23. For a school musical, ticket sales are represented by the equation $T = \$3.25c + \$5.00a$, where c is the number of children's tickets and a is the number of adult tickets. What is the total for ticket sales if 120 children's tickets and 250 adult tickets are sold?

A. \$2400.00 **B.** \$2200.00

C. \$2000.00 **D.** \$1640.00

24. A restaurant has 2 large tables which seat 15 people at each and x tables which seat 4 people each. If the restaurant can seat no more than 160 persons, which inequality could be used to determine the number of tables for 4 in the restaurant?

A. $15 + 4x \leq 160$ **B.** $30 + 4x \leq 160$

C. $4x - 30 \leq 160$ **D.** $2x + 4(15) \geq 160$

25. Choose the algebraic equation below that illustrates the **commutative property**.

A. $x + y = 1 + x$

B. $5 + 15k + 8 = 3 + 5 + 15k$

C. $-13 + 8t - 5 = 8t - 13 - 5$

D. $7c + 3d = 7c - 3d$

26. Look at the list.

I. exchange numerator and denominator of a fraction.
II. 1 divided by the number.
III. reverse the order of two addends.
IV. exchange divisor and dividend.

Which of these describes how to obtain the reciprocal of a number?

A. I only

B. I and II only

C. III only

D. III and IV only

27. What expression is the opposite of $(c - d)$?

A. $-d + c$

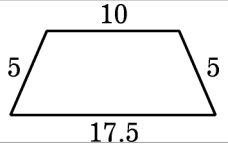
B. $-d - c$

C. $d - c$

D. $-(c + d)$

Problem-Attic Sample Document
all items from Virginia SOL Math Database

Grade 7

Num	Scoring	Standard	Answer
1		7.01A	532.63
2	D	7.03A	7 units
3	C	7.03A	$-580 + 580 = 0$
4	B	7.03B	P is closer to zero than Q.
5	C	7.04	3.4 meters
6	D	7.04	15.9 quarts
7	C	7.04	$\frac{12}{3.95} = \frac{9}{x}$
8	A	7.04	\$45 per hour
9		7.04	Biker 2 by $3\frac{1}{3}$ mph ($13\frac{1}{3}$ vs. 10)
10	B	7.05B	$100\,\text{ft}^2$
11	B	7.06	
12	C	7.06	They are all congruent and similar.
13	A	7.09	$\frac{1}{4}$
14	B	7.09	150%
15	B	7.09	32%
16		7.09	228; 47%; about 72, 108 and 48
17	C	7.10	48
18	C	7.13A	expression
19	D	7.13A	$-5n$
20	C	7.13A	$12.5 + 8n$
21	D	7.13B	12
22	D	7.13B	18
23	D	7.13B	\$1640.00
24	B	7.15A	$30 + 4x \leq 160$
25	C	7.16A	$-13 + 8t - 5 = 8t - 13 - 5$
26	B	7.16D	I and II only
27	C	7.16D	$d - c$

Virginia Math Samples — Grade 8

1. A star is 5.0×10^{18} miles from the earth. Another star is 3 times this distance. How far from earth is the second star?

   A. 15×10^{9} **B.** 1.5×10^{19}

   C. 5.0×10^{24} **D.** 5.0×10^{36}

2. Name the exponent, n, that will make each of the following true.

   a) $2 \times 3^{n} \times 5 = 270$

   b) $2^{n} \times 3 \times 5 = 60$

   c) $7^{n} \times 17 = 833$

   d) $2^{n} \times 3^{n} \times 5^{n} = 27000$

3. The number of visitors to the Banff National Park in 1998 was $4.187\,239 \times 10^{6}$. The number of visitors to the Kootenay National Park was 3,107,082.

   a) Which park had more visitors?

   b) How many more visitors?

   c) Express the previous answer in scientific notation.

4. Which statements are true for all real numbers x?

   I. If $|x| > 1$ then $x > 1$ or $x < -1$.

   II. If $|x| > 1$ then $x > 1$.

   III. If $|x| > 1$ then $x < -1$.

   A. I only **B.** III only

   C. I and III **D.** I and II

5. Place a mark in every box that describes the number.

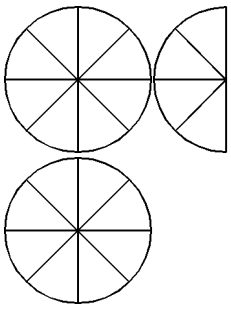
Number	Real	Irrational	Rational	Integer
$-\pi$				
-11.1689				
$\lvert\sqrt{169}\rvert$				
$\frac{5}{3}$				
$4\sqrt{5}$				
$\sqrt{101}$				

   Give reasons for your sorting.

6. Bill had $2\frac{1}{2}$ pies that he wanted to divide equally among 4 people. What fraction of a whole pie would each person receive?

A. $\frac{5}{8}$ **B.** $\frac{3}{8}$

C. $\frac{7}{16}$ **D.** $1\frac{1}{16}$



7. A normal shower uses 80 gallons of water, but a low-flow showerhead will reduce that amount by 38%. What is a good estimate of the amount of water used with that low-flow showerhead?

A. 48 gallons **B.** 64 gallons

C. 72 gallons **D.** 112 gallons

8. A die is supposed to extrude pipes that are exactly 3 inches in diameter. The die actually extruded the pipes at diameter of 2.75 inches. What was the approximate percent error in the cross-sectional area of the actual pipe from what was intended?

A. 20% **B.** 19.1%

C. 15.9% **D.** 13.7%

9. Find the simple interest on \$850.00 at $7\frac{1}{2}\%$ if the money is left in the bank for:

a) 1 year?

b) 3 years?

c) 5 years?

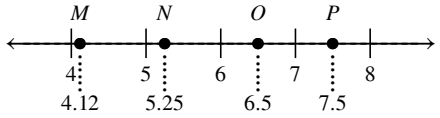
d) 9 months?

e) 18 months?

10. If $a = 4$, what is the value of $4a^2 - 7a - 1$?

A. 3 **B.** 30 **C.** 35 **D.** 58

11. Which integer is the closest to $\sqrt{38}$?



A. 7 **B.** 6 **C.** 5 **D.** 4

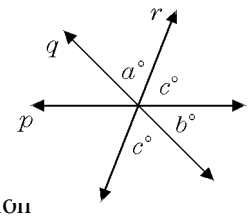
12. If the measure of $m\angle c = 70^\circ$, then what is the measure of $\angle b$?

A. 40°

B. 70°

C. 75°

D. not enough information



13. Angles *ABC* and *XYZ* are complementary angles. If $m\angle ABC$ is 18 more than three times $m\angle XYZ$, find $m\angle XYZ$.

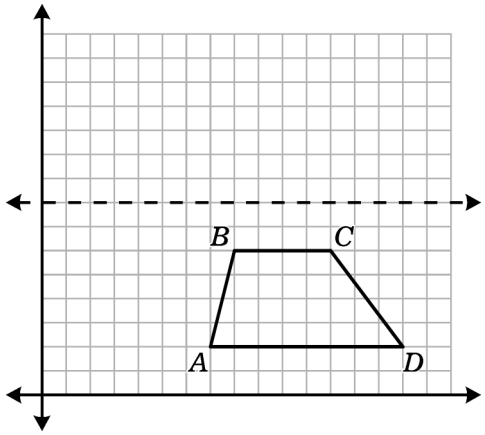
A. 18° **B.** 54° **C.** 72° **D.** 90°

14. The volume of a cylinder is 474.2 cm^3. If the area of the base is 4.742 cm^2, what is the height?

A. 10 cm **B.** 100 cm

C. 0.1 cm **D.** 1 cm

15. If the trapezoid *ABCD* is reflected about the dashed line, what would be the new coordinates for *D′*?



A. (7, −2) **B.** (7, 14)

C. (15, −2) **D.** (15, 14)

16. On a coordinate system, $\triangle ABC$ is transformed into $\triangle AB'C'$. This is done by lengthening segments AB and AC to create segments AB' and AC'. If segment BC is parallel to segment $B'C'$, then which of the following statements are true?

I. $\triangle AB'C'$ is a dilation of $\triangle ABC$.

II. $\triangle AB'C'$ is a translation of $\triangle ABC$.

III. $\triangle AB'C'$ is similar to $\triangle ABC$.

IV. $\triangle AB'C'$ is congruent to $\triangle ABC$.

A. II only **B.** III only

C. I and III **D.** II and IV

17. Match the definition with the correct geometric term. Place the letter in front of the definition. Letters may be used more than once.

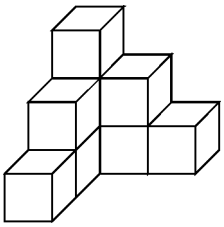
a) rotation ____ A change in position resulting from a slide.

b) translation ____ A change in position resulting from a flip.

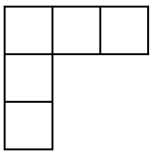
c) reflection ____ A change in position resulting from a turn.

____ A mirror is an example of this type of transformation.

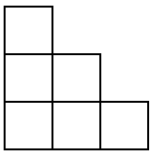
18. The solid figure is composed of cubes. Which diagram could represent the top view of the solid figure?



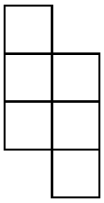
A.



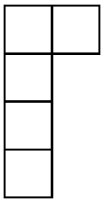
B.



C.



D.



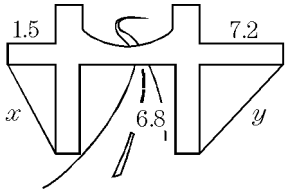
19. A highway bridge is anchored to the ground by a right triangle as shown in the picture. How long is the embankment labeled x?

A. about 8 m

B. about 7 m

C. about 6 m

D. about 4 m



20. Matthew and Andrew leave an intersection at the same time. Matthew travels due east at 30 mph and Andrew travels due south at 40 mph. If nothing causes either to stop for any reason how far apart are they after 1 hour?

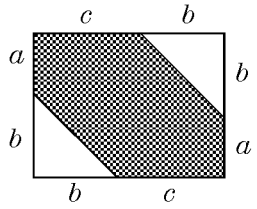
A. 45 miles **B.** 50 miles

C. 55 miles **D.** 60 miles

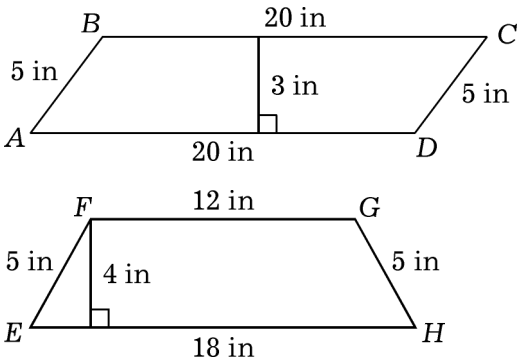
21. In the diagram, $a = 4$, $b = 6$, and $c = 8$. Find the area of the shaded region.

A. 68 **B.** 98

C. 104 **D.** 140



22. Parallelogram *ABCD* and isosceles trapezoid *EFGH* are shown below.

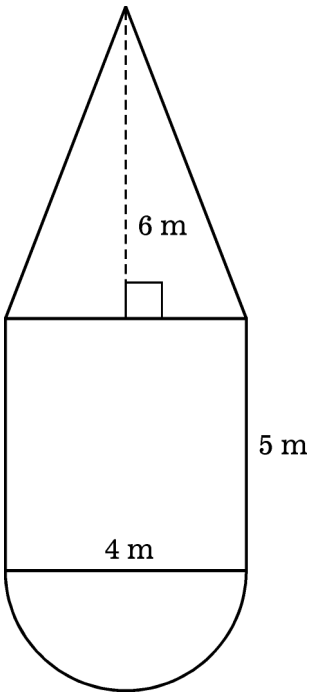


a) Compare the two shapes. Describe at least four similarities or differences.

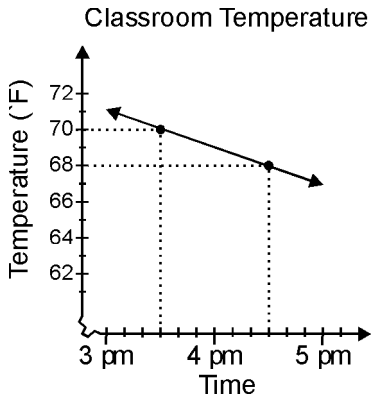
b) Find the area and perimeter of each figure.

23. The drawing shows the new library building. The main library is 4 meters wide and 5 meters long. A semi-circle alcove features a reading area with comfortable seating. The library entrance hall is a triangular section that extends off the main library 6 meters to the tip.

Find the area of the new library building.



24. Several schools turn the thermostat down at the end of the school day in order to conserve energy. The graph shows approximately how this effects the temperature in a classroom on a winter day. Which of the following *best* describes the relationship?



A. For each 6 minutes, there is a decline of 2° in temperature.

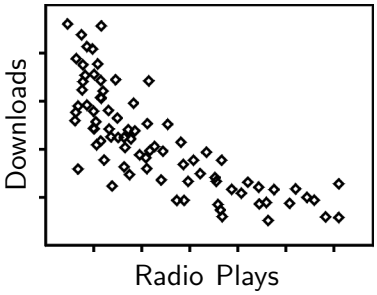
B. The temperature decreases 1° every 30 minutes.

C. The temperature decreases 3° every hour.

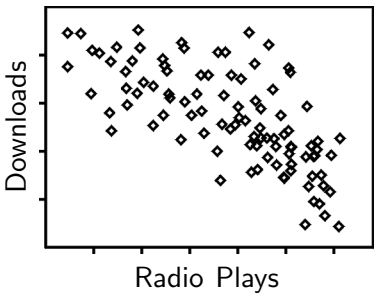
D. The temperature remains the same even after students are dismissed.

25. A rock-n-roll band kept track of the number of times its new song was played on FM radio and the number of times the song was downloaded through the internet. Which graph most likely shows the relationship?

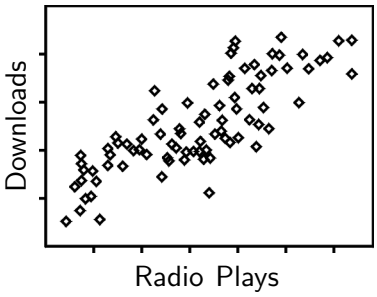
A.



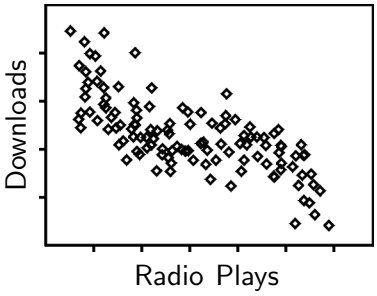
B.



C.



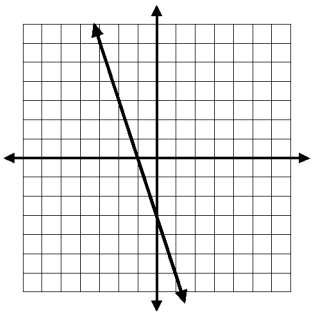
D.



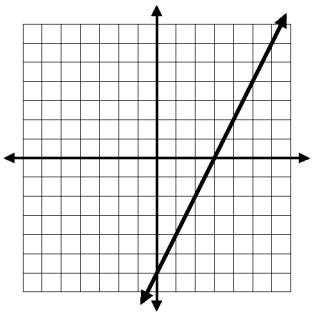
26. Which graph corresponds to the table of values?

x	2	4	5
y	−2	2	4

A.



B.



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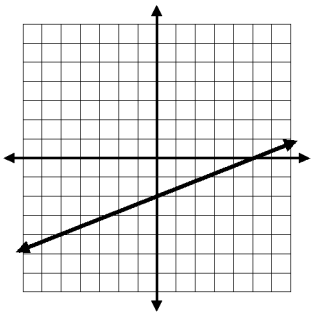
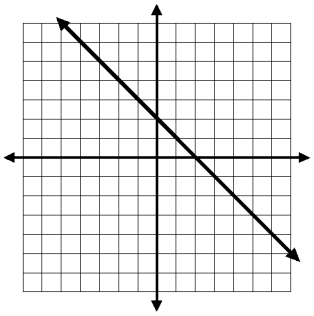


D.



27. The cost for extras for an action movie is shown in the table. Which of the following is the relation of C, the cost, and n, the number of extras?

A. $C = 100n + 250$

B. $C = 250n + 100$

C. $C = 150n + 200$

D. $C = 200n + 150$

n	C ($)
1	350
2	550
3	750
5	1150

28. Solve: $\frac{2y}{5} + 5 = -9$

A. −9 **B.** −14 **C.** −24 **D.** −35

29. In order to solve the equation $7 - x = 10$, you can either:

1) take the opposite of both sides, then add −7, or

2) add −7, then take the opposite of both sides.

Explain why applying the steps in the opposite order leads to the the exact same solution.

30. The graph of the line $y = \frac{1}{2}x$ passes through the first and third quadrants. The slope is changed to $-\frac{1}{2}$ without changing either intercept. Through which quadrants does the line now pass?

A. I and II

B. I and III

C. II and III

D. II and IV

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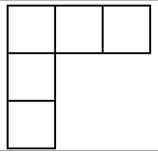
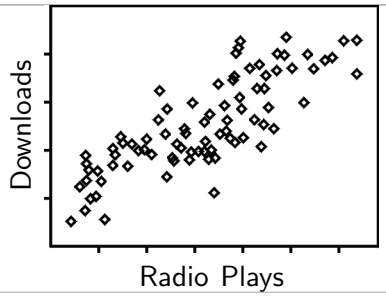
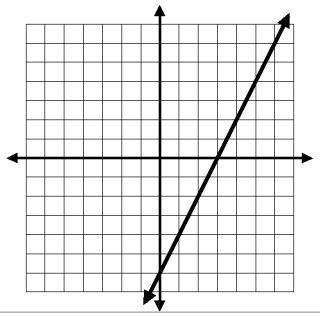
Grade 8

Num	Scoring	Standard	Answer
1	B	8.01A	1.5×10^{19}
2		8.01A	3; 2; 2; 3
3		8.01B	Banff; 1,080,157; $1.080\,157 \times 10^{6}$
4	A	8.02	I only
5		8.02	[task]
6	A	8.03A	$\frac{5}{8}$
7	A	8.03A	48 gallons
8	C	8.03A	15.9%
9		8.03A	\$63.75; \$191.25; \$318.75; \$47.81; \$95.63
10	C	8.04	35
11	B	8.05B	6
12	A	8.06A	40°
13	A	8.06A	18°
14	B	8.07A	100 cm
15	D	8.08A	(15, 14)
16	C	8.08A	I and III
17		8.08B	b, c, a, c
18	A	8.09	
19	B	8.10B	about 7 m
20	B	8.10B	50 miles
21	C	8.11	104
22		8.11	[answers vary] parallelogram: $A = 60\,\text{in}^2$, $P = 50\,\text{in}$ isos. trapezoid: $A = 60\,\text{in}^2$, $P = 40\,\text{in}$
23		8.11	$32 + 2\pi\,\text{m}^2$
24	B	8.13A	The temperature decreases 1° every 30 minutes.
25	C	8.13B	

26	B	8.14	
27	D	8.14	$C = 200n + 150$
28	D	8.15A	-35
29		8.15C	[answers vary]
30	D	8.16	II and IV

Virginia Math Samples — Algebra I

1. The interior dimensions of a bathtub are length $= 7x + 2$, width $= 4x - 3$ and depth $= 2x$.

   a) Write an expression in terms of x to represent the volume of the bathtub.

   b) If $x = 8$ inches, what is the volume of the bathtub?

2. Simplify: $\dfrac{5^7 7^{-5}}{9^{-2}} \cdot \dfrac{5^{-3} 9^4}{7^2}$

   A. $\dfrac{5^4 9^2}{7^3}$ **B.** $\dfrac{5^4 9^6}{7^7}$

   C. $\dfrac{9^2}{5^4 7^7}$ **D.** $\dfrac{5^4 9^2}{7^7}$

3. Divide: $x - 1 \overline{)\, 2x^4 - x^3 - 6x^2 + 9x + 1}$

   A. $2x^3 - x^2 - 6x + 9 + \dfrac{1}{x-1}$

   B. $2x^3 + x^2 - 5x + 9$

   C. $2x^3 - x^2 - 6x + 10$

   D. $2x^3 + x^2 - 5x + 4 + \dfrac{5}{x-1}$

4. The formula $A = \frac{1}{2}h(b_1 + b_2)$ is used to find the area of a trapezoid with height h and bases b_1 and b_2. What does the formula look like if solved for the base b_1 ?

   A. $b_1 = 2Ah - b_2$ **B.** $b_1 = \dfrac{A}{2h} - b_2$

   C. $b_1 = \dfrac{2A}{h} - b_2$ **D.** $b_1 = \dfrac{2A - b_2}{h}$

5. Solve: $\dfrac{3}{5x - 10} = \dfrac{1}{(x+2)(x-2)}$

Step 1	$\dfrac{3}{5x-10}$	$=$	$\dfrac{1}{(x+2)(x-2)}$
Step 2	$3(x+2)(x-2)$	$=$	$1(5x-10)$
Step 3	$3x^2 - 12$	$=$	$5x - 10$
Step 4	$3x^2 - 5x - 2$	$=$	0
Step 5	$(3x+1)(x-2)$	$=$	0
Step 6	x	$=$	$-\frac{1}{3}$ or $x = 2$
Step 7	x	$=$	$-\frac{1}{3}$

What justifies going from step 6 to step 7 in the solution?

A. The original equation is defined at $x = -\frac{1}{3}$ and $x = 2$

B. The original equation is not defined at $x = -\frac{1}{3}$

C. The original equation is defined at $x = 2$

D. The original equation is not defined at $x = 2$

6. Solve: $-2x^2 = 16x + 30$

A. $\{-5, -3\}$ **B.** $\{2, -5\}$

C. $\{3, 5\}$ **D.** $\{-5, -3, 2\}$

7. Consider solving $n^2 + {}^-9n - 4 = 0$ by completing the square.

$$n^2 + {}^-9n + \_\_\_\_ = 4 + \_\_\_\_$$

What is the number that goes in the blanks?

A. $\frac{81}{2}$ **B.** $\frac{81}{4}$ **C.** $\frac{9}{2}$ **D.** $-\frac{81}{2}$

8. Solve this system of equations using elimination:

$$3x - y = -7$$
$$x + 2y = -14$$

A. $(0, 7)$ **B.** $(2, -8)$

C. $(-4, -5)$ **D.** $(-6, -4)$

9. If $(3, 5)$ is a solution to the system

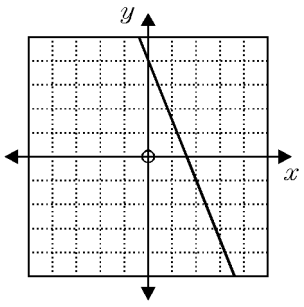
$$ax + by = 21$$
$$ax - by = -9$$

then the values of a and b are:

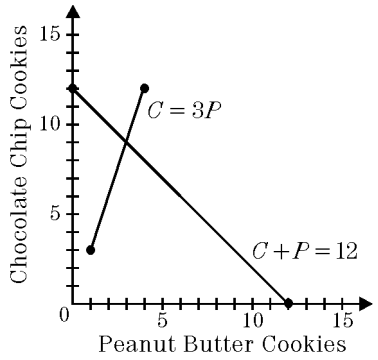
A. 2 and -3 **B.** -2 and -3

C. 4 and $\frac{21}{5}$ **D.** 2 and 3

10. At what point does the line $y = \frac{1}{2}x - 3$ intersect the line in the graph?



11. The two line segments shown are representative of the information that Renee has a total of 12 cookies in chocolate chip and peanut butter, ($C + P = 12$), and the number of chocolate chip cookies is three times the number of peanut butter cookies, ($C = 3P$). How many of each type of cookie does she have?



A. 2 chocolate chip and 10 peanut butter

B. 3 chocolate chip and 9 peanut butter

C. 6 chocolate chip and 6 peanut butter

D. 9 chocolate chip and 3 peanut butter

12. Ellen is having a party and wants to make mixed nuts. Peanuts cost \$2.00 per pound and cashews cost \$4.50 per pound. Ellen wishes to make 7 pounds of mixed nuts but pay only \$24.00. Which system of equations best represents the situation if P represents the number of pounds of Peanuts and C the number of pounds of Cashews?

A. $2P + 4.5C = 24$
$P + C = 7$

B. $200P + 450C = 24$
$P + C = 7$

C. $2P + 45C = 45$
$P = 7 - C$

D. $2P + 4.5C = 7$
$P = C + 24$

13. A tanker truck leaves a rest stop at 8:00 am traveling 50 mph. Two hours later a flatbed truck leaves the same rest stop traveling 60 mph. At what time will they be 85 miles apart?

A. 3:30 pm **B.** 11:30 am

C. 1:30 pm **D.** 10:30 am

14. Write the equation or equations that would be used to solve the following problems. In each case state what the letter or letters represent. [Solution of the equations is not required.]

    a) John can do a job in 10 minutes less than William. One day John worked alone for 15 minutes; then William worked alone for 20 minutes to finish the job. How long would it take each working alone to do the job?

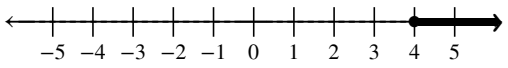
    b) If a two-digit number is divided by the sum of the digits, the results is 4. If the digits are reversed, the new number exceeds the original number by 36. Find the original number.

15. Hannah and Travis are both saving money from their after school jobs to pay for the Junior Class Ski Trip. Hannah starts with \$125 and saves \$50 a week. Travis starts with \$175 and saves \$30 a week. The ski trip cost \$475.

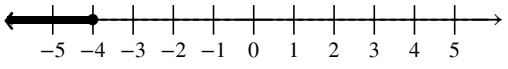
    Who will be able to pay for their ski trip first? How many weeks will it take this person?

16. Which graph represents the solution to $2p + 3 \geq p - 1$?

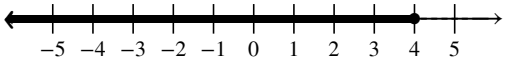
A.



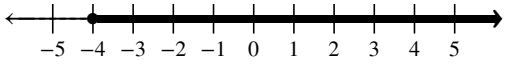
B.



C.



D.



17. In a collection of nickels and dimes the number of dimes is 3 more than twice the number of nickels. If the value of the collection is \$1.80, how many nickels are there?

    A. 6 **B.** 8 **C.** 15 **D.** 24

18. Solve: $-4(x + 3) < -3x - 3$

    A. $x > -12$ **B.** $x < -9$

    C. $x > -9$ **D.** $x > 9$

19. Find the slope of the line whose equation is $\frac{x}{5} - \frac{y}{2} = 3$.

A. -10 **B.** -5 **C.** $-\frac{2}{5}$ **D.** $\frac{2}{5}$

20. Find the equation of the line which has a slope of $\frac{3}{4}$ and contains the point $(0, 3)$.

A. $y = \frac{3}{4}x - 3$ **B.** $y = \frac{3}{4}x + 3$

C. $y = 3x - \frac{3}{4}$ **D.** $y = -3x + \frac{3}{4}$

21. Which of the following statements are true?

I. Any set of ordered pairs is a function.

II. The domain of a relation is the set containing the first members of its ordered pairs.

III. The independent variable in a relation is the variable used for the range.

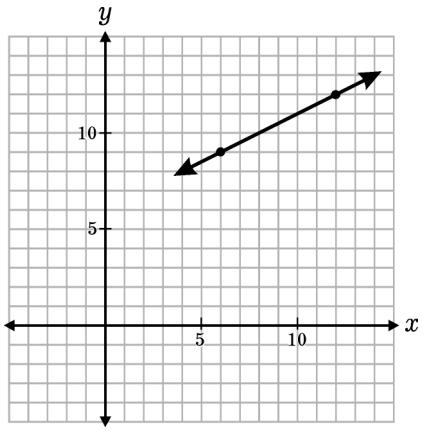
IV. A function is a relation in which each domain value is paired with exactly one range value.

A. I **B.** II **C.** I and III

D. II and IV

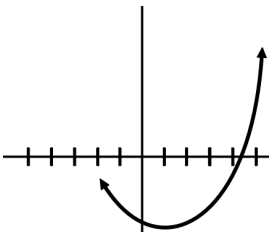
22. The graph shows a linear function.

What is the zero of the function?



A. 6 **B.** -9.5 **C.** -10 **D.** -12

23. Here is the graph of a quadratic function and a table of values:



x	$f(x)$
1	-6
2	-5
3	-2
5	10

The function is symmetric about the line $x = 1$. One of the x-intercepts is shown on the graph. The other is _____.

A. between 0 and 1

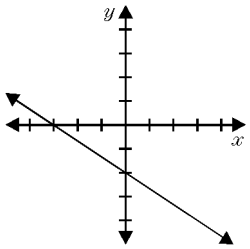
B. between -2 and -1

C. between -3 and -2

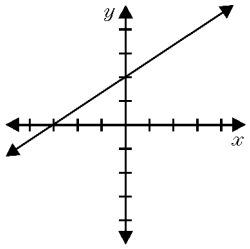
D. between -4 and -3

24. Which graph represents the line with slope of $-\frac{2}{3}$ and y-intercept of -2?

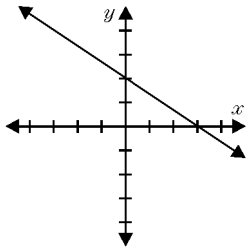
A.



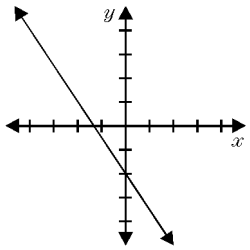
B.



C.



D.



25. Which equation corresponds to the values in this table?

x	y
-3	-5
-2	0
-1	3
0	4
1	3

A. $y = 4 - x$ **B.** $y = 4 - x^2$

C. $y = x^2 - 4$ **D.** $y = -2x - 1$

26. Translate into an expression.

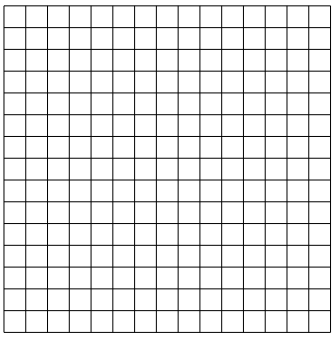
An initial patch of molds in a laboratory covers $5\,\text{cm}^2$. The area of the patch is increasing at a rate of 12% per day. What will be the area of the patch after 8 days?

A. $12(1 - 0.05)^8$ **B.** $5(1 + 0.12)^8$

C. $5(1 - 0.12)^8$ **D.** $12(1 + 0.08)^5$

27. The following table lists values of x and y for a function.

x	y
8	−10
5	−4
−1	8
2	2
6	−6
0	6
3	0
0.5	5



a) Plot the points on the coordinate grid provided.

b) Draw a line through the points.

c) Write the slope of the line.

d) Write the equation of the line in slope-intercept form.

e) Write the equation of the line in $Ax + By = C$ form.

f) Describe a situation that the graph might represent.

28. The following table shows Charlene's test scores for 5 subjects, the mean score for each test, and the standard deviation.

SUBJECT	*TEST SCORE*	*MEAN SCORE*	*STANDARD DEVIATION*
Math	84	80	10
Chemistry	82	80	6
Physics	85	83	8
Biology	78	75	4
History	90	81	13

For her *worst* score, what percent of the class did even worse than Charlene?

A. 40 **B.** 60 **C.** 63 **D.** 75

29. The table shows stopping distances for a car at different speeds, assuming the road surface is good and the driver is alert.

Speed in km/h	Stopping distance in meters
0	0
20	7.5
40	20
60	37
80	60
100	88
120	120

If x represents the speed in km/h and y represents the stopping distance in meters, use a calculator to find the quadratic regression equation for the data. Answer accurate to three decimal places.

A. $y = 0.006x^2 + 0.245x + 0.012$

B. $y = 7.942x^2 + 7.152x + 4.604$

C. $y = 9.620x^2 + 2.776x + 3.583$

D. $y = 5.598x^2 + 2.107x + 1.571$

30. The following table shows the scores on report cards of 6 students in Mathematics, English, Spanish and Science.

Student Number	Mathematics	English	Spanish	Science
1	72	74	69	69
2	76	84	77	81
3	78	86	77	85
4	89	86	79	86
5	89	89	89	87
6	92	92	93	91

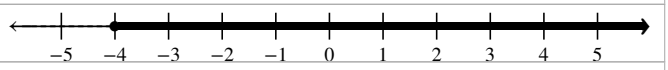
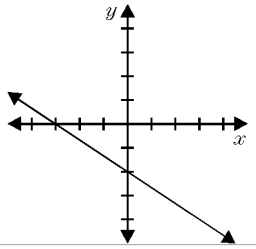
a) Draw a scatter plot for the data for Mathematics and Science.

b) Find the mean coordinates.

c) Show the mean fit line on the scatter plot.

Problem-Attic Sample Document
all items from Virginia SOL Math Database

Algebra I

Num	Scoring	Standard	Answer
1		A.01	$2x(7x+2)(4x-3)$; 26,912 cubic inches
2	B	A.02A	$\frac{5^4 9^6}{7^7}$
3	D	A.02B	$2x^3 + x^2 - 5x + 4 + \frac{5}{x-1}$
4	C	A.04A	$b_1 = \frac{2A}{h} - b_2$
5	D	A.04B	The original equation is not defined at $x = 2$
6	A	A.04C	$\{-5, -3\}$
7	B	A.04C	$\frac{81}{4}$
8	C	A.04E	$(-4, -5)$
9	D	A.04E	2 and 3
10		A.04E	$(\frac{7}{3}, -\frac{11}{6})$
11	D	A.04F	9 chocolate chip and 3 peanut butter
12	A	A.04F	$2P + 4.5C = 24$ $P + C = 7$
13	B	A.04F	11:30 am
14		A.04F	$\frac{15}{x-10} + \frac{20}{x} = 1$; $\frac{10t+u}{t+u} = 4$, $10u + t - 36 = 10t + u$
15		A.04F	Hannah, 7 weeks
16	D	A.05A	
17	A	A.04F	6
18	C	A.05A	$x > -9$
19	D	A.06A	$\frac{2}{5}$
20	B	A.06B	$y = \frac{3}{4}x + 3$
21	D	A.07A	II and IV
22	D	A.07C	-12
23	C	A.07D	between -3 and -2
24	A	A.07F	
25	B	A.07F	$y = 4 - x^2$
26	B	A.07F	$5(1 + 0.12)^8$
27		A.07F	-2; $y = -2x + 6$; $y + 2x = 6$
28	B	A.09	60
29	A	A.11	$y = 0.006x^2 + 0.245x + 0.012$

30	A.11	The mean coordinates are (82.67, 83.17).

1. What is a negation of the following statement?

   "Some teenagers do not love chocolate."

   A. "All teenagers do not hate chocolate."

   B. "Some teenagers love chocolate."

   C. "No teenagers love chocolate."

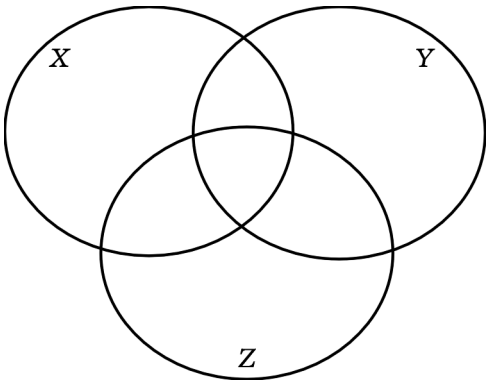
   D. "All teenagers love chocolate."

2. Use the following information to fill in the Venn diagram below. Include more than one number in each section.

   Set X = {even numbers}

   Set Y = {multiples of 3}

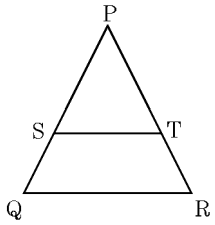
   Set Z = {multiples of 5}



   Describe the intersection of two sets and the intersection of all three sets.

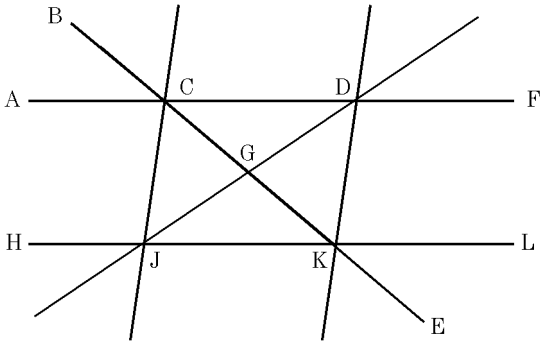
3. Given: $SQ = TR$, $\angle PST \cong \angle PTS$

Prove: $\triangle PQR$ is isosceles.



Statements	Reasons

4. If $m\angle CGJ$ is 55°, what is $m\angle DGK$?



A. 35° **B.** 55° **C.** 90° **D.** 125°

5. Monica and Jan take part in a scavenger hunt. They begin the hunt at the same starting point. Monica walks 30 m north, then 70 m east to find her first treasure. Jan walks 50 m south, then 20 m west and stops. How far are the girls from each other?

A. $\sqrt{500}$ m **B.** $\sqrt{8700}$ m

C. $\sqrt{14500}$ m **D.** $\sqrt{16900}$ m

6. A right triangle has vertices $P(-2, 5)$, $Q(5, 2)$ and $R(8, 9)$. What are the coordinates of the midpoint of the hypotenuse?

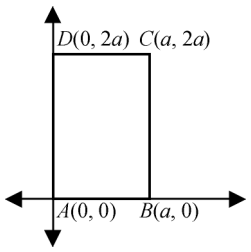
A. $(\frac{3}{2}, \frac{7}{2})$ **B.** $(\frac{11}{2}, \frac{11}{2})$

C. $(7, 2)$ **D.** $(3, 7)$

7. In the diagram, rectangle $ABCD$ has vertices $A(0, 0)$, $B(a, 0)$, $C(a, 2a)$, $D(0, 2a)$. What is the area of rectangle $ABCD$?

A. $4a$ **B.** $2a^2$

C. a^2 **D.** $a\sqrt{2}$



8. a) The line $x + y = 3$ intersects the parabola $y = x^2 + 1$ at points A and B. Determine the coordinates of A and B.

   b) If C is the vertex of the given parabola, determine the area of $\triangle ABC$.

9. In slope-intercept form, what is the equation of the line parallel to the line $2x + 5y = 10$ and having the same x-intercept as $3x + 4y = 15$?

A. $y = -\frac{5}{2}x + 2$ **B.** $y = -\frac{2}{5}x + 2$

C. $y = -\frac{5}{2}x + {}^-2$ **D.** $y = \frac{2}{5}x + {}^-4$

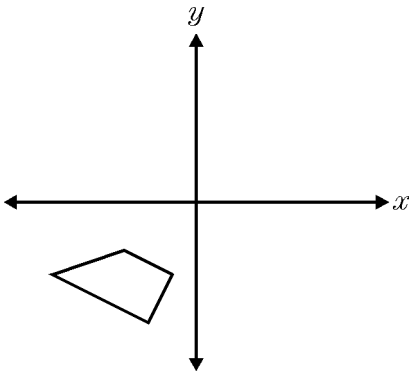
10. $Q(-5, 7)$, $U(9, 7)$, $A(6, -4)$ and $D(-2, -4)$ are vertices of a quadrilateral.

    a) Sketch $QUAD$ on a graph.

    b) What shape is $QUAD$? Show all your calculations.

    c) Prove that $\overline{QA}$ and $\overline{DU}$ are perpendicular bisectors.

11. A trapezoid is in the third quadrant of an x-y coordinate system, as shown here:



The trapezoid is reflected across the line $y = -x$, then it is reflected across the x-axis. Which of these transformations will put it back in its original position (with the same orientation it had originally)?

I. a clockwise rotation of 90° about the origin

II. a reflection across the line $y = -x$, then a reflection across the y-axis

III. a reflection across the line $y = x$, then a reflection across the x-axis

A. I only **B.** I and II only

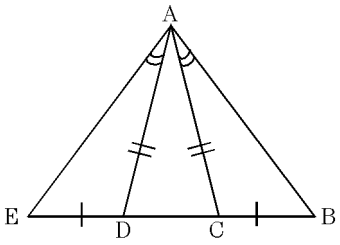
C. II and III only **D.** I, II and III

12. Which set of numbers can represent the lengths of the sides of a triangle?

A. $\{4, 4, 8\}$ **B.** $\{3, 9, 14\}$

C. $\{3, 5, 7\}$ **D.** $\{1, 2, 3\}$

13. Given the diagram as marked. Which statement is correct?



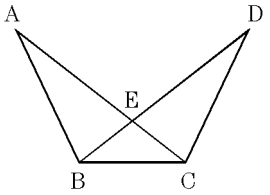
A. $\triangle AED \cong \triangle ABC$ and $AE = AB$

B. $\triangle ABD \cong \triangle ACE$ and $m\angle E = m\angle B$

C. $\triangle AED \cong \triangle ACB$ and $m\angle E = m\angle B$

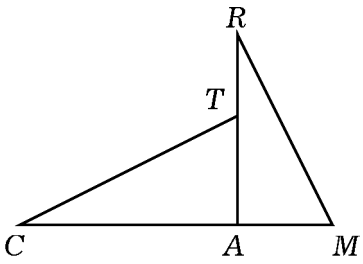
D. $\triangle AED \cong \triangle ACB$ and $m\angle ADE = m\angle ACB$

14. In the diagram, $AB = DC$ and $AC = DB$. Why does $m\angle DBC = m\angle ACB$?



15. In the figure, $\angle R \cong \angle C$.

Which of these statements, if true, is sufficient to prove that triangles CAT and RAM are similar?



A. $\overline{RA} \perp \overline{CM}$

B. T is the midpoint of RA

C. $CA = 2 \cdot AM$

D. $CT + TA = RM + MA$

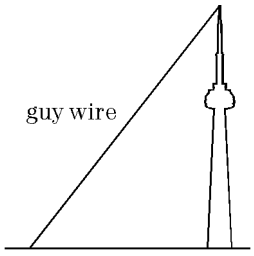
16. A guy wire attached to the top of a radio antenna is bolted to the ground 48 m from the base of the tower. If the wire makes an angle of 14° with the ground, how high is the radio antenna? Express your answer to 2 decimal places.

A. 10.02 m

B. 11.97 m

C. 14.35 m

D. 17.96 m



17. A Boeing 757 is approaching Reagan National Airport (DCA) at a cruising altitude of 32,500 ft. The FAA mandates a 12.5° angle of descent at DCA.

a) Sketch a diagram to represent the situation.

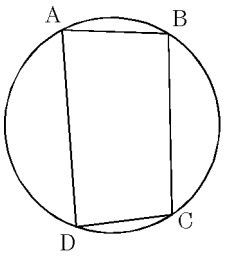
b) What is the Boeing's air distance from DCA when it starts to descend? Answer to the nearest hundredth of a mile.

c) Find the Boeing's ground distance from DCA to the nearest hundredth of a mile.

18. If $m\angle A = (2x + 5)°$ and $m\angle C = (3x - 20)°$, then what is the measure of $\angle BAD$?

A. 33° **B.** 39°

C. 83° **D.** 97°



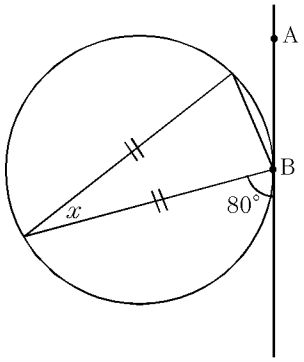
19. $\overline{AB}$ is a tangent line. Find x.

A. 5°

B. 10°

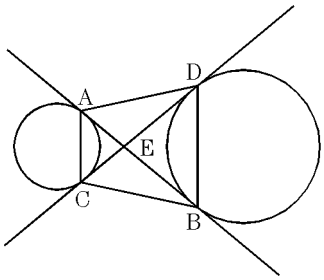
C. 16°

D. 20°



20. Given: $\overline{AB}$ and $\overline{CD}$ are tangents

Prove: $\triangle ADE \cong \triangle CBE$

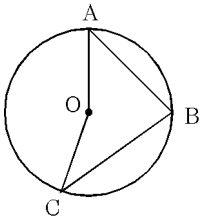


statement	reason
1. $\overline{AB}$ and $\overline{CD}$ are tangents	_____
2. $AE = CE$	_____
3. _____	Vertically opposite angles equal
4. $DE = BE$	_____
5. $\triangle ADE \cong \triangle CBE$	_____

21. In the circle with center O, $m\angle C = 30°$. What is the measure of minor arc $\overset{\frown}{BC}$?

A. 60° **B.** 105°

C. 115° **D.** 120°



22. A circle passes through the vertices of a right triangle $P(5, 7)$, $Q(-1, -1)$, and $R(-2, 0)$. What is the equation of the circle?

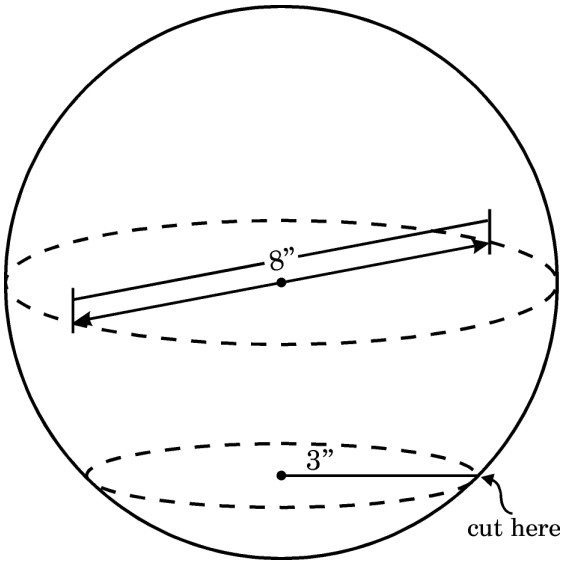
A. $(x - 2)^2 + (y - 3)^2 = 25$

B. $(x + 2)^2 + (y + 3)^2 = 5$

C. $(x + 2)^2 + (y + 3)^2 = 49$

D. $(x - 2)^2 + (y + 3)^2 = 5$

23. A florist is creating centerpieces for an awards dinner. As a base for each centerpiece, the florist uses a sphere of floral foam that has an 8 inch diameter. A horizontal slice is removed from the bottom of the sphere so that the centerpiece lies flat.



The radius of the flat surface of the slice is 3 inches. What is the approximate height of the floral foam?

A. 8 in **B.** 7.5 in

C. 6.5 in **D.** 5 in

24. In the diagram, $\overline{BD} \parallel \overline{AE}$. Which of the following statements are true for this diagram?

I. $\triangle ACE \sim \triangle BCD$

II. $\triangle ACE \sim \triangle DBC$

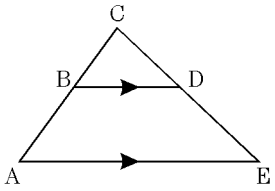
III. $m\angle A = m\angle CBD$

A. II only

B. III only

C. I and II

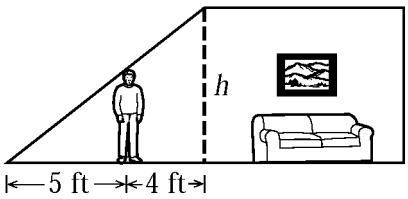
D. I and III



25. A food-product company want to increase the size of candy jar that it sells. Currently, the jar holds 150 pieces of candy and is roughly cylindrical, 6.5 cm in diameter 10.5 cm in height. If all dimensions of the jar are increased by a factor of 1.25, then how many pieces of candy should it hold (rounded to the nearest ten)?

A. 150 **B.** 200 **C.** 210 **D.** 290

26. Rosario's parents are letting him turn the attic into his bedroom. He plans to put a loft bed that is 7 feet tall where the couch currently sits. To determine the height of the attic, Rosario stands in the alcove where his head touches the ceiling. He is 5′8″ tall. How many inches will Rosario have between to top of his bed and the ceiling: Show all your work

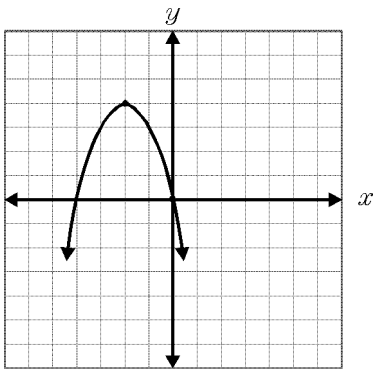


Problem-Attic Sample Document
all items from Virginia SOL Math Database

Geometry

Num	Scoring	Standard	Answer
1	D	G.01A	"All teenagers love chocolate."
2		G.01C	[task]
3		G.01D	[proof]
4	B	G.02C	55°
5	C	G.03A	$\sqrt{14500}$ m
6	D	G.03A	$(3, 7)$
7	B	G.03A	$2a^2$
8		G.03A	$A(1, 2)$, $B(-2, 5)$; 3
9	B	G.03B	$y = -\frac{2}{5}x + 2$
10		G.03B	[graph]; isosceles trapezoid; [proof]
11	D	G.03D	I, II and III
12	C	G.05C	$\{3, 5, 7\}$
13	A	G.06	$\triangle AED \cong \triangle ABC$ and $AE = AB$
14		G.06	they are corresponding parts of congruent triangles
15	A	G.07	$\overline{RA} \perp \overline{CM}$
16	B	G.08	11.97 m
17		G.08	[diagram]; 28.44 miles; 27.76 miles
18	C	G.09	83°
19	D	G.11A	20°
20		G.11A	[proof]
21	D	G.11C	120°
22	A	G.12	$(x - 2)^2 + (y - 3)^2 = 25$
23	C	G.13	6.5 in
24	D	G.14A	I and III
25	D	G.14B	290
26		G.14D	38 inches

1. Is the vertex of the parabola shown in the graph a maximum or a minimum? What are the coordinates of the vertex?



A. minimum; $(-2, 4)$

B. maximum; $(-2, 4)$

C. minimum; $(4, -2)$

D. maximum; $(2, 4)$

2. Determine which quadratic function has a larger minimum.

$f(x) = x^2 + 2x - 3$

x	-2	-1	0	1	2
$g(x)$	-5	-6	-5	-2	3

A. $f(x)$; minimum $= -3$

B. $g(x)$; minimum $= -6$

C. $g(x)$; minimum $= -2$

D. $f(x)$; minimum $= -4$

3. If the minimum of $y = 2x^2 + 3ax + k$ is $(-3, 7)$, then:

   a) what is the value of a?

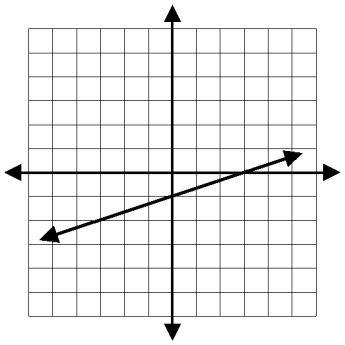
   b) what is the value of k?

4. Homer is allergic to grass. Before going to his company's picnic, he takes allergy medicine. The concentration level, C, of the medicine in Homer's body follows the equation $C = 12t - t^2$, where t is time in hours.

   a) Homer wants his allergy medicine concentration to be at a maximum 1 hour after he arrives at the picnic. How long before the picnic should Homer take a dose of his allergy medicine?

   b) Homer forgot to bring his allergy medicine with him. He wants to leave the picnic when the concentration level of the allergy medicine is 10% of the maximum. How long will Homer stay at the picnic? Round to the nearest half-hour.

5. The graph of a line is shown. Which of the following is the equation of the line that has half the slope and is then shifted up two units?

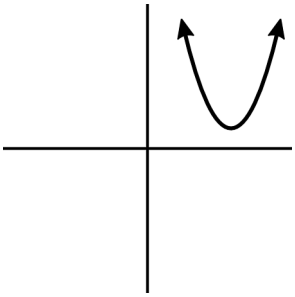


A. $-\frac{1}{6}x - 2$ **B.** $-\frac{1}{6}x + 1$

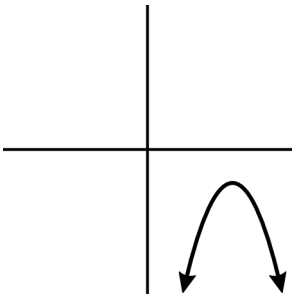
C. $\frac{1}{6}x + 1$ **D.** $\frac{1}{6}x - 2$

6. Which one of the graphs could be for $y = a(x - h)^2 + k$, if $a < 0$, $h > 0$, and $k < 0$?

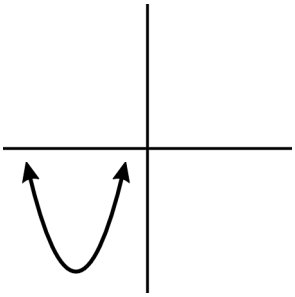
A.



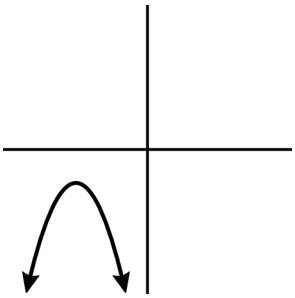
B.



C.



D.



7. Which function does *not* have $y = x^2$ as its parent function?

A. $4y - 2x^2 + 5 = 0$

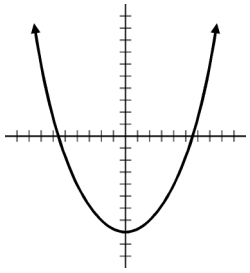
B. $y = \left(\frac{x}{2}\right)^2 - 4$

C. $y = \frac{1}{3}x^2 - 7$

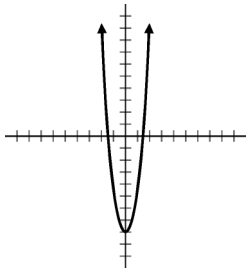
D. $(y + 3)^2 = (x - 2)^2$

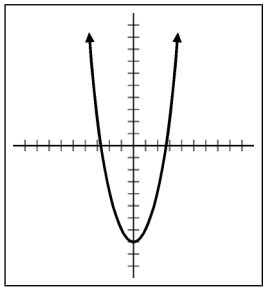
8. The box contains the graph of the equation $y = x^2 - 8$. What would the graph look like if the equation were changed to $y = \frac{1}{4}x^2 - 8$?

A.

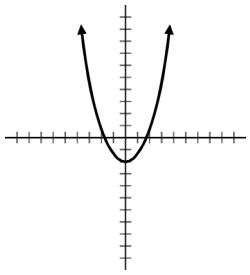


B.

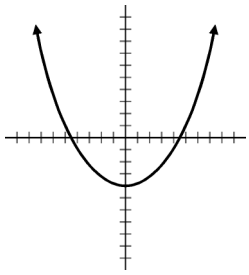




C.



D.



9. Let $f(x) = x^2$ and $g(x)$ be $f(x)$ reflected over the x-axis and translated to the left 7 units. Which table represents this translation?

A.

x	$g(x)$
0	−49
1	−36
2	−25

B.

x	$g(x)$
0	−7
1	−8
2	−11

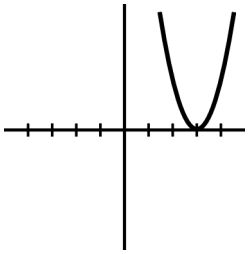
C.

x	$g(x)$
0	−49
1	−64
2	−81

D.

x	$g(x)$
0	7
1	6
2	3

10. Here is the graph of $f(x)$:



Which of the following equations will transform $f(x)$ into $g(x)$, where $g(x)$ is compressed horizontally and shifted down 6 units?

A. $g(x) = \frac{1}{3}f(x) - 6$ **B.** $g(x) = \frac{1}{3}f(x + 6)$

C. $g(x) = 3f(x + 6)$ **D.** $g(x) = 3f(x) - 6$

11. The parabola $y = x^2$ is changed to the form $y = a(x - p)^2 + q$ by translating the parabola 2 units up and 4 units right and expanding it vertically by a factor of 3. What are the values of a, p, and q?

A. $a = 3, p = 4, q = 2$

B. $a = 4, p = 2, q = 3$

C. $a = 2, p = 3, q = 4$

D. $a = 2, p = -4, q = 3$

12. The following are parabolic functions:

1. $f(x) = x^2 + 3$
2. $f(x) = 3x^2 - 1$
3. $f(x) = 2x^2 - 3$
4. $f(x) = x^2 + 5$

Which list places the parabolas in order from highest vertex to lowest vertex?

A. 4, 1, 2, 3 **B.** 2, 3, 4, 1

C. 3, 4, 1, 2 **D.** 4, 1, 3, 2

13. John wants to invest \$10,100.00 at a local bank. The investment will earn an annual percentage rate of 4.5% compounded continuously for 5 years. Unfortunately, a mistake was made and the deposit was only for \$10,000.00. How much money did John lose because of this error? Use $A = Pe^{rt}$ to calculate the future value of the investment.

A. \$225.10 **B.** \$53.45

C. \$181.25 **D.** \$125.23

14. Julie is buying chocolate chip and oatmeal cookies from the bakery. Chocolate chip cookies cost 25¢ each and oatmeal cookies cost 20¢ each. She wants to buy a mixture of at least 50 cookies. Julie is planning to spend less than \$10. Let:

C = number of chocolate chip cookies she can buy.

M = number of oatmeal cookies she can buy.

Select the system of inequalities that represents this situation.

A. $0.25C + 0.20M \geq 10.00$
$C + M \geq 50$

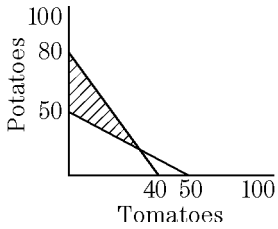
B. $0.25C + 0.20M < 10.00$
$C + M \geq 50$

C. $0.25C + 0.20M \geq 10.00$
$C + M > 50$

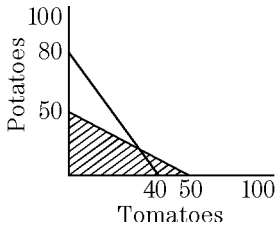
D. $0.25C + 0.20M < 10.00$
$C + M > 50$

15. A farm has an area of 50 hectares (Ha). It is to be planted with tomatoes and potatoes. At most \$8000 can be spent on planting. The planting cost for potatoes is \$100/Ha and for tomatoes \$200/Ha. Choose the graph that best shows the area of each crop that can be planted.

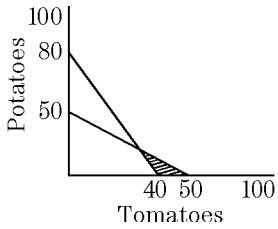
A.



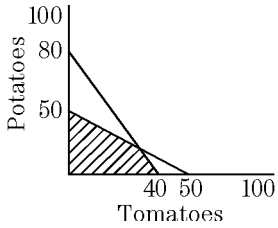
B.



C.



D.



16. Solve the following system of equations for x:

$$\begin{aligned} x + 2y + z &= -2 \\ 4y - z &= 1 \\ 3x - 2y - 2z &= 13 \end{aligned}$$

A. 2 **B.** −3 **C.** −2 **D.** 3

17. A small comedy club makes a profit of $8.00 a person as long as they get between 40 and 80 people. If they get more than 80 people their profit decreases by $0.04 a person for each person over 80 people. What number of people will maximize their profit?

18. Bayside High School Orchestra performed two concerts to raise money for a field trip. Tickets were $8 for adults and $5 for students and teachers. In total, 423 people attended both concerts, and the orchestra raised $2616. The number of teachers who came was a third of the number of students.

    a) Represent this situation with equations.

    b) How many students came to the concerts?

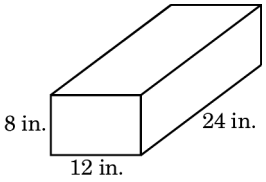
    c) If ticket were $10 for adults, $6 for students, and $5 for teachers, how much *more* money would the BHS Orchestra have raised?

19. A small corral is to be built so that it also has fence splitting the corral into two smaller areas to separate the animals. There is 60 m of fencing available in which to build this corral.

    a) What is the maximum area that can be enclosed?

    b) What are the dimensions that enclose the maximum area?

20. Good Times Candy wants to decrease its packaging costs. A diagram of its current package is shown.



    a) What is the volume of the current box? Show all your calculations

    b) What is the surface area of the current box? Show all your work.

    c) Good times candy plans to lower their packaging cost by decreasing the surface area but keeping volume the same. What are possible box dimensions with the same volume but less surface area? Show all your calculations.

Problem-Attic Sample Document
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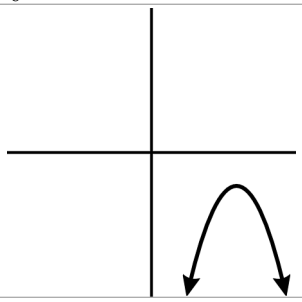
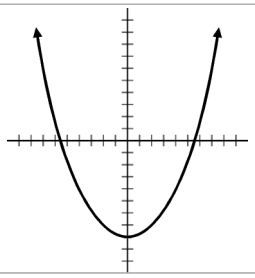
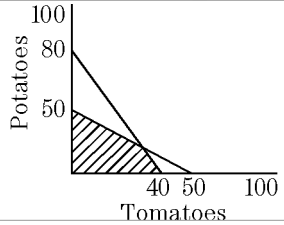
Alg, Functions, Data Analysis

Num	Scoring	Standard	Answer
1	B	AFDA.01	maximum; $(-2, 4)$
2	D	AFDA.01	$f(x)$; minimum $= -4$
3		AFDA.01	4; 25
4		AFDA.01	5 hours; 6.5 hours
5	C	AFDA.02	$\frac{1}{6}x + 1$
6	B	AFDA.02	
7	D	AFDA.02	$(y + 3)^2 = (x - 2)^2$
8	A	AFDA.02	
9	C	AFDA.02	x | $g(x)$ 0 | -49 1 | -64 2 | -81
10	D	AFDA.02	$g(x) = 3f(x) - 6$
11	A	AFDA.02	$a = 3, p = 4, q = 2$
12	A	AFDA.02	$4, 1, 2, 3$
13	D	AFDA.04	\$125.23
14	B	AFDA.05	$0.25C + 0.20M < 10.00$ $C + M \geq 50$
15	D	AFDA.05	
16	A	AFDA.05	2
17		AFDA.05	140

18	AFDA.05	$A + S + T = 423$ 192 students; \$526 $8A + 5S + 5T = 2616$ $T = \frac{1}{3}S$
19	AFDA.05	$150\,\text{m}^2$; 10 m by 15 m
20	AFDA.05	$2304\,\text{in}^3$; $1152\,\text{in}^2$; answers may vary

Virginia Math Samples — Algebra II

1. Simplify: $\dfrac{\left(\dfrac{7x^2y}{21x^2-6x}\right)}{\left(\dfrac{14x}{49x^2-4}\right)}$

A. $\dfrac{6}{7xy+2y}$ **B.** $\dfrac{7xy+2xy}{6y}$

C. $\dfrac{6}{7xy+2x}$ **D.** $\dfrac{7xy+2y}{6}$

2. Simplify: $\sqrt{3a}\cdot\sqrt{15a^2}$

A. $3a\sqrt{5a}$ **B.** $3a^2\sqrt{5a}$

C. $5a^2\sqrt{3a}$ **D.** $5a\sqrt{3a^2}$

3. Once simplified, which of the following is a rational number?

A. $(\sqrt{3}+\sqrt{7})^2$

B. $\sqrt{3}(\sqrt{3}+\sqrt{6})$

C. $\dfrac{\sqrt{7}}{\sqrt{98}}$

D. $(\sqrt{5}-\sqrt{3})(\sqrt{3}+\sqrt{5})$

4. Express in simplest form:

a) $\sqrt{60}-6\sqrt{\frac{5}{3}}$

b) $\dfrac{2\sqrt{3}+3\sqrt{2}}{\sqrt{8}-\sqrt{12}}$

c) $\sqrt{\dfrac{25x^5}{y^3}}$

5. The recursive definition of a geometric sequence is

$$a_n = \begin{cases} a_1 = a_1 \\ a_n = a_{n-1}r, \ n \geq 2 \end{cases}$$

What is the recursive equation for the sequence 3, 9, 27, 81 . . . ?

A. $a_1 = 3$, $a_n = \frac{1}{3}a_{n-1}$ **B.** $a_1 = 3$, $a_n = 3a_{n-1}$

C. $a_1 = 3$, $a_n = a_{n-1} + 3$ **D.** $a_1 = 3$, $a_n = a_{n-1} - 3$

6. Find t_{10} of the geometric sequence having $a = k^2b^3$ and $t_2 = k^3b^6$.

A. k^9b^{24} **B.** $k^{10}b^{27}$

C. $k^{11}b^{30}$ **D.** $k^{12}b^{33}$

7. Find the sum of the first 7 terms of the geometric series $3 + 6 + 12 + \cdots$.

A. 93 **B.** 99 **C.** 189 **D.** 381

8. A worker is paid \$0.03 on the first day, \$0.06 on the second day, \$0.12 on the third, \$0.24 on the fourth day, and so on. How much money in total does the worker earn after working for 24 days?

A. \$403,316.45 **B.** \$503,316.45

C. \$513,316.45 **D.** \$703,316.45

9. The sum of the 2nd and 3rd terms of a geometric series is 12. The sum of the 3rd and 4th terms is 108. Determine 1) the ratio of the series; and 2) the 6th term.

10. Express the sum of $2\sqrt{-9}$ and $3\sqrt{-16}$ as a monomial in terms of i.

A. $18i$ **B.** $-18i$ **C.** $66i$ **D.** $-66i$

11. Express the product in standard form.

$$(2 + \sqrt{-36})(3 - \sqrt{-4})$$

A. $18 - 14i$ **B.** $-6 - 14i$

C. $-6 + 14i$ **D.** $18 + 14i$

12. Solve: $3 < |2x - 5| < 15$

13. Choose the value for k so that the roots of the equation $6n^2 + 12n + k = 0$ are imaginary.

A. -7 **B.** -6 **C.** 6 **D.** 7

14. Solve for x: $\dfrac{\frac{x+1}{x-4} \cdot \frac{x^2-2x-8}{x+1}}{x-3} + 4 = 0$

A. $\{-2\}$ **B.** $\{0\}$

C. $\{2\}$ **D.** $\{4\}$

15. An airline flies between Dallas and Chicago. There are a maximum of 200 passengers on a flight. The profit per passenger is represented by this equation:

$$P = \frac{nt - 10000}{ns}$$

where P is profit (dollars), n is the number of passengers, t is the average ticket price, and s is the service cost.

On a certain flight, the average ticket price is \$200 and the service cost is \$5. Which of the following is the *best* explanation of the profit per passenger compared to the number of passengers on a flight?

A. If there are at least 50 passengers, there is a profit of \$40 each; otherwise there is a loss.

B. There is \$30 profit per passenger if the flight is full, and there is a loss with fewer than 50 passengers.

C. The profit increases by \$5 per passenger after the first 50, then it falls by \$5 per passenger after 150.

D. There is no profit for the first 50 passengers, then the profit increases by \$5 for each passenger up to 200.

16. The following equation describes the number of meters, x, which must be added to a string that measures 4 meters in length so that a pendulum will have a complete swing (back and forth) that lasts 5 seconds.

$$\sqrt{4 + x} = 2.5$$

How much longer should the string be so that the complete swing of the pendulum will be 5 seconds?

A. 1.5 m **B.** 2.1 m

C. 2.25 m **D.** 3.5 m

17. To the nearest tenth, what is the sum of the x values of the intersection points of $\frac{x^2}{16} + \frac{y^2}{4} = 1$ and $y = x^2 - 5$ where $y > 0$?

A. −0.8 **B.** 0 **C.** 0.8 **D.** 4.2

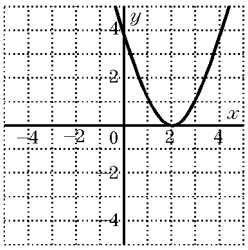
18. Given $y = \sqrt{x}$, which equation represents the graph after a horizontal expansion by a factor of 3 and translation of 2 units right?

A. $y = \sqrt{\frac{1}{3}(x + 2)}$ **B.** $y = \sqrt{3(x - 2)}$

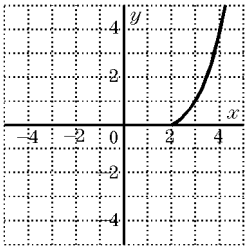
C. $y = \sqrt{\frac{1}{3}(x - 2)}$ **D.** $y = 3\sqrt{x - 2}$

19. Which graph is the inverse of $y = 2 + \sqrt{x}$?

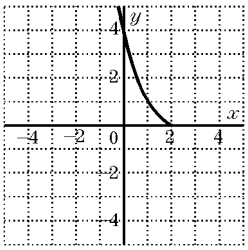
A.



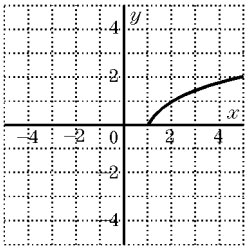
B.



C.



D.



20. Given $f(x) = 5x + 3$ and $g(x) = \dfrac{x-3}{5}$.

a) Find k so that $f(k) = g(k)$.

b) If $f[g(n+7)] = 11$, find the value of n.

c) If $f(x^2 + 5x) = 33$ find the value of x.

21. The complete factorization of $x^4 - 4x^2 - 45$ is:

A. $(x+3)(x-3)(x+5i)(x-5i)$

B. $(x+3)(x-3)(x+i\sqrt{5})(x-i\sqrt{5})$

C. $(x+\sqrt{5})(x-\sqrt{5})(x+3i)(x-3i)$

D. $(x+5)(x-5)(x+i\sqrt{3})(x-i\sqrt{3})$

22. A student is conducting a science experiment to calculate how long it takes a heated cube of metal to cool to room temperature.

This table summarizes the results of the experiment.

Time in minutes (x)	Temperature °C	Metal Temperature minus room temperature (y)
0	98	
2	80	
4	66	
6	56	
8	47	
10	41	

The room temperature is 20° C. First, calculate the difference between the temperature of the metal and the room. Then use a calculator to find the exponential regression equation for the data. Answer accurate to three decimal places.

A. $y = 86.988\,(0.896)^x$

B. $y = 78.035\,(0.877)^x$

C. $y = 65.528\,(0.525)^x$

D. $y = 47.654\,(0.781)^x$

23. The diameters of inflated balloons, in millimeters, are normally distributed with a mean of 200 and a standard deviation of 12. Balloons will burst if their diameters exceed 220. What percent of balloons will burst?

A. 4.75% **B.** 5.67%

C. 6.33% **D.** 95.25%

24. A local health clinic surveys its patients about their water drinking habits. It found the data is normally distributed, the mean amount of water consumed daily is 62 ounces, and the standard deviation is 5.2. How much water, in ounces, do approximately 95% of the patients drink each day?

A. 56.8 to 67.2 **B.** 54.2 to 69.8

C. 51.6 to 72.4 **D.** 41.2 to 62.0

25. In how many ways can five men and four women be seated on a bench if the men and women must be in alternate seats?

A. 3236 **B.** 2880 **C.** 2328 **D.** 2100

26. A money jar contains 7 nickels and 8 dimes.

a) How many ways can 3 coins be selected at random?

b) What is the probability that exactly 2 coins are dimes?

c) What is the probability that exactly 1 coin is a dime?

d) What is the probability that at least 1 coin is a nickel?

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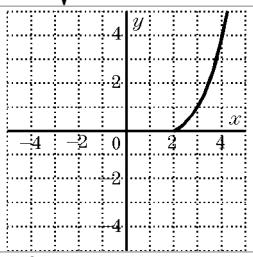
Algebra II

Num	Scoring	Standard	Answer
1	D	AII.01A	$\frac{7xy + 2y}{6}$
2	A	AII.01B	$3a\sqrt{5a}$
3	D	AII.01B	$(\sqrt{5} - \sqrt{3})(\sqrt{3} + \sqrt{5})$
4		AII.01B	$0;\ \frac{-5\sqrt{6}}{2} - 6;\ \frac{5x^2\sqrt{x}}{y\sqrt{y}}$
5	B	AII.02	$a_1 = 3$ $a_n = 3a_{n-1}$
6	C	AII.02	$k^{11}b^{30}$
7	D	AII.02	381
8	B	AII.02	$503,316.45
9		AII.02	9, 7873.2
10	A	AII.03	$18i$
11	D	AII.03	$18 + 14i$
12		AII.04A	$-5 < x < 1$ or $4 < x < 10$
13	D	AII.04B	7
14	C	AII.04C	$\{2\}$
15	B	AII.04C	There is $30 profit per passenger if the flight is full, and there is a loss with fewer than 50 passengers.
16	C	AII.04D	2.25 m
17	B	AII.05	0
18	C	AII.06	$y = \sqrt{\frac{1}{3}(x - 2)}$
19	B	AII.07G	
20		AII.07H	$-\frac{3}{4};\ 4;\ -6$ or 1
21	B	AII.08	$(x + 3)(x - 3)(x + i\sqrt{5})(x - i\sqrt{5})$
22	B	AII.09	$y = 78.035\,(0.877)^x$
23	A	AII.11	4.75%
24	C	AII.11	51.6 to 72.4
25	B	AII.12	2880
26		AII.12	$455;\ \frac{196}{455};\ \frac{168}{455};\ \frac{399}{455}$

Virginia Math Samples — Trigonometry

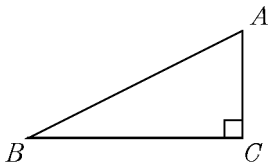
1. The angle θ is in the first quadrant and $\sin\theta = \frac{3}{\sqrt{34}}$.

   Determine possible coordinates for point P on the terminal arm of θ.

   A. $(5, \sqrt{34})$ **B.** $(3, 5)$

   C. $(34, 3)$ **D.** $(5, 3)$

2. In the triangle below, $\cos A = \frac{7}{25}$. Find $\sin B$.



   A. $\frac{25}{24}$ **B.** $\frac{24}{25}$ **C.** $\frac{7}{25}$ **D.** $\frac{7}{24}$

3. Find the positive value of $\sin\left(\arccos\frac{5}{13}\right)$.

   A. $\frac{12}{13}$ **B.** $\frac{5}{13}$ **C.** $\frac{7}{13}$ **D.** $\frac{5}{7}$

4. Determine the smallest positive angle θ, in radians, such that $\csc\theta = -\sqrt{2}$.

   A. 1.98 **B.** 2.36 **C.** 3.93 **D.** 5.50

5. Find the exact value of θ for $0 \le \theta < 2\pi^R$ in the following functions.

   a) $\csc\theta = 2$

   b) $\cos\theta = -\dfrac{1}{\sqrt{2}}$

   c) $\csc^2\theta = \frac{4}{3}$

   d) $8\sin^3\theta = 1$

6. Simplify: $\dfrac{\sin\theta}{1+\cos\theta}$

   A. $\sec\theta - \csc\theta$ **B.** $\csc\theta + \cot\theta$

   C. $\csc\theta + \tan\theta$ **D.** $\csc\theta - \cot\theta$

7. If A is a positive acute angle, express $\sin A$ in terms of $\tan A$.

A. $\dfrac{\tan A}{\sqrt{\tan^2 A + 1}}$ **B.** $\dfrac{\tan A}{\sqrt{\tan^2 A - 1}}$

C. $\dfrac{\tan A}{\sqrt{\tan A + 1}}$ **D.** $\dfrac{\tan A}{\sqrt{\tan A - 1}}$

8. $\tan(45^\circ - \theta)$ equals:

A. $\dfrac{1 - \tan\theta}{1 + \tan\theta}$ **B.** $\dfrac{\tan\theta - 1}{\tan\theta + 1}$

C. $\cot\theta$ **D.** $\dfrac{1}{\cot\theta}$

9. Prove: $\dfrac{\sec^2\theta}{1 + \sin\theta} = \dfrac{\sec^2\theta - \sec\theta\tan\theta}{\cos^2\theta}$

10. Find the phase shift and period for the function $y = 2\sin 3\left(x - \dfrac{\pi}{2}\right) + 1$.

A. phase shift: $\dfrac{\pi}{2}$; period: $\dfrac{2\pi}{3}$

B. phase shift: $\dfrac{\pi}{2}$; period: $-\dfrac{2\pi}{3}$

C. phase shift: $-\dfrac{\pi}{2}$; period: $-\dfrac{2\pi}{3}$

D. phase shift: $\dfrac{\pi}{3}$; period: 3

11. The graph of $f(x)$ is a cosine curve having a period of 0.1, amplitude of 8, phase displacement (for the cosine) of 0.02, and vertical displacement of -5. Which of the following is the equation of this graph?

A. $f(x) = 8\cos 20(x - 0.02) - 5$

B. $f(x) = 8\cos(10x - 0.02) - 5$

C. $f(x) = 8\cos 10(x - 0.02) - 5$

D. $f(x) = 8\cos 20\pi(x - 0.02) - 5$

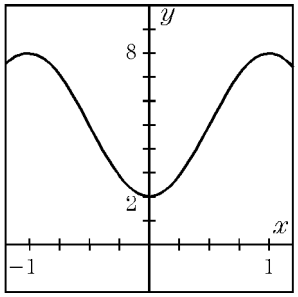
12. Find the period, amplitude, and range for the following functions.

a) $y = 3\cos(x)^\circ$

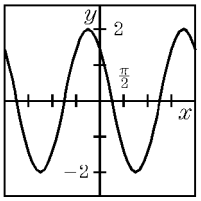
b) $y = -2\sin(5x)^R$

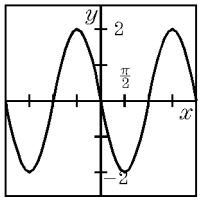
c) $y = 12 + 5\sin 4(x + 30)^\circ$

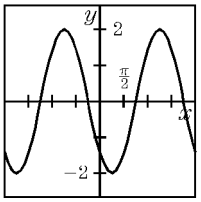
13. What is the equation, in terms of cosine, of the graph?

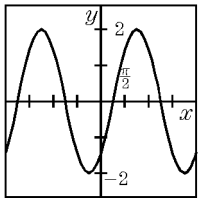


14. Which of the graphs shown is the graph of $y = -2\cos\left(x - \frac{\pi}{4}\right)$?

A.


B.


C.


D.


15. Sketch the graph and find the equation that best describes the situation:

> A pebble is caught up in the tread of a car tire. The pebble is $\frac{1}{4}$ inch off the ground when it is closest to the ground. At a speed of 35 mph the fifteen-inch-radius tire completes approximately 6 revolutions per second. Show the height of the pebble (from the ground) over time.

16. The graph of $y = \cos x$ is transformed to $y = a\cos(x - c) + d$ by a vertical compression by a factor of $\frac{1}{3}$ and a translation 2 units down. The new equation is:

A. $y = \frac{1}{3}\cos x + 2$ **B.** $y = \frac{1}{3}\cos x - 2$

C. $y = 3\cos x + 2$ **D.** $y = \frac{1}{3}\cos(x - 2)$

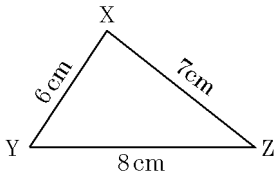
17. Given that $\cos x = \sin(4x + 20^\circ)$, find the measure of acute angle x in degrees.

A. 22° **B.** 36° **C.** 30° **D.** 14°

18. What is the exact value of the $\cos m\angle XYZ$?

A. $\frac{1}{8}$ **B.** $\frac{1}{4}$

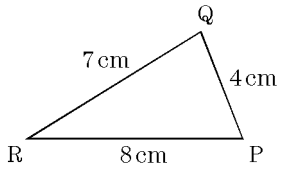
C. $\frac{17}{32}$ **D.** $\frac{11}{16}$



19. To the nearest degree, what is the measure of the smallest angle?

A. 29 **B.** 30

C. 31 **D.** 35



20. An S O S is received by Coast Guard cutter A from an endangered ship. The cutter finds the bearing of the ship is $58^\circ 20'$ (N $58^\circ 20'$ E). Simultaneously, another Coast Guard cutter B, 82 miles directly north of the first cutter, finds the bearing of the ship in distress is $110^\circ 50'$ (S $69^\circ 10'$ E). How far is the source of the S O S from the nearer cutter, to the nearest mile?

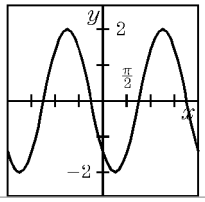
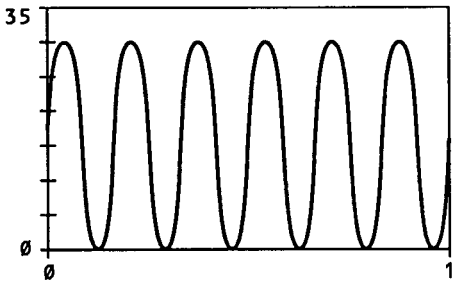
A. 88 **B.** 85 **C.** 90 **D.** 92

21. The sides of a triangle are 579, 914 and 1,247. Find the largest angle of the triangle to the nearest ten minutes.

22. Two lighthouses (at A and B) on a relatively straight shore are 2.5 km apart. They both spot a boat (at C). If $m\angle BAC = 65^\circ$ and $m\angle CBA = 20^\circ$, then how far is the boat from the lighthouse at B? Answer to 2 decimal places.

Problem-Attic Sample Document
all items from Virginia SOL Math Database

Trigonometry

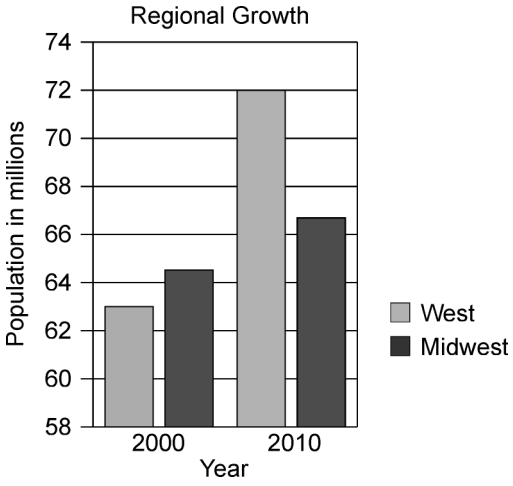
Num	Scoring	Standard	Answer
1	D	T.01	$(5, 3)$
2	C	T.02	$\frac{7}{25}$
3	A	T.04	$\frac{12}{13}$
4	C	T.04	3.93
5		T.04	$\frac{\pi}{6}, \frac{5\pi}{6}; \frac{3\pi}{4}, \frac{5\pi}{4}; \frac{\pi}{3}, \frac{2\pi}{3}, \frac{4\pi}{3}, \frac{5\pi}{3}; \frac{\pi}{6}, \frac{5\pi}{6}$
6	D	T.05	$\csc\theta - \cot\theta$
7	A	T.05	$\frac{\tan A}{\sqrt{\tan^2 A + 1}}$
8	A	T.05	$\frac{1 - \tan\theta}{1 + \tan\theta}$
9		T.05	[proof]
10	A	T.06B	phase shift: $\frac{\pi}{2}$; period: $\frac{2\pi}{3}$
11	D	T.06B	$f(x) = 8\cos 20\pi(x - 0.02) - 5$
12		T.06B	$P = 360^\circ,\ A = 3,\ -3 \le y \le 3;\ P = \frac{2\pi}{5},\ A = 2,\ -2 \le y \le 2;$ $P = 90^\circ,\ A = 5,\ 7 \le y \le 17$
13		T.06B	$y = 5 + 3\cos\pi(x + 1)$
14	C	T.06C	
15		T.06C	Answers may vary. Example: $f(t) = 14.75 \cdot \sin(12\pi t) + 15$. 
16	B	T.06D	$y = \frac{1}{3}\cos x - 2$
17	D	T.08	14°
18	C	T.09	$\frac{17}{32}$
19	B	T.09	30
20	A	T.09	88
21		T.09	$111^\circ 20'$
22		T.09	2.27 km

1. Manny and Mo bought same eight video games, but Mo bought used, so each was half the price Manny paid. If the mean price Mo paid is $16, and the median is $16.50, what are the mean and median prices for Manny's video games?

A. $8.25, $8.25 **B.** $8, $8.25

C. $32, $33 **D.** $16.25

2. Germaine did a report about population growth in different regions of the U.S. She included this graph:



Source: U.S. Census Bureau, 2010

What is a reasonable conclusion from the graph?

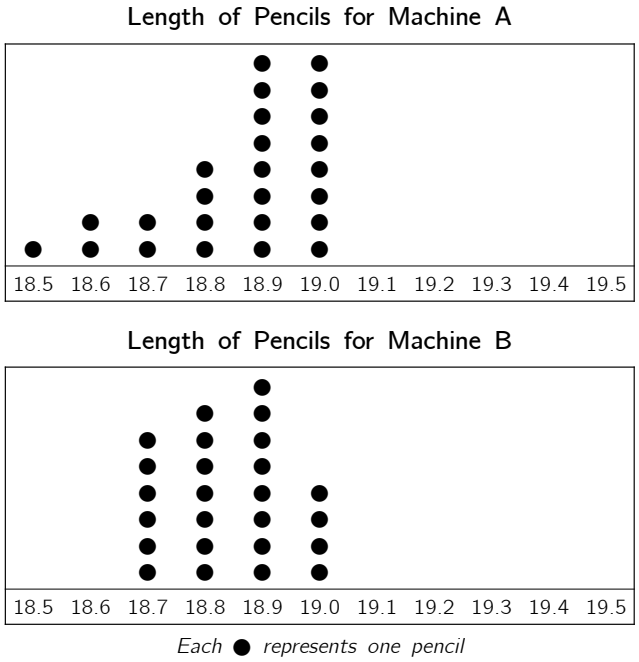
A. The population of the Midwest decreased during the period 2000–2010.

B. The population of the West more than doubled over the ten-year period.

C. The Midwest grew faster than the West in 2000 and slower than the West in 2010.

D. The population increase was about four times greater in the West than in the Midwest.

3. A company uses two machines to manufacture pencils. The length of the pencils must be 19 cm ±0.2 cm or they are rejected. Dotplots of 25 pencils produced by each machine are shown.



Why is machine A better at producing pencils than machine B?

4. Which of the following are true?

I. A correlation coefficient, r, measures the strength of the linear relationship between variables but does not provide any proof of a cause-effect relationship between the variables.

II. The symbol for the correlation coefficient is μ.

III. If the correlation coefficient is close to $+1$ or -1, we shall say there is a strong correlation.

A. II only **B.** I and II only

C. I and III only **D.** I, II and III

5. The table below shows how much bottled water was consumed per person in North America during the years 1998 through 2003.

Year	1998	1999	2000	2001	2002	2003
Liters of bottled water per person	59.7	68	72.2	77.9	85.2	91.8

If the actual consumption in 2007 was 128.5 liters of bottled water per person, find the difference between the projected amount and the actual amount.

A. 18 **B.** -18 **C.** 16 **D.** -16

6. Using the data in the table, first find the linear regression line y_1 for the data. Then use the equation to find the value of g in the table.

x	y	$y_1(x)$	Residual
0	4	a	f
2	2	b	g
3	-5	c	h
6	-6	d	i
12	-9	e	j

A. 2.020642 **B.** 2.098623

C. −1.74541 **D.** 1.488532

7. The number of households (in millions) using online banking is given in the following table. (Here, $x = 0$ corresponds to 1998.)

Year, x	0	1	2	3	4	5
Households, y	4.5	7.5	10.0	13.0	15.6	18.0

a) Find the equation of the least-squares line for these data.

b) Find the number of households using on-line banking at the beginning of 2004.

8. The table given shows the grades for a class of students in math.

Grade x_i	Frequency f_i
96	2
92	1
90	3
85	1
80	4
75	1
70	2
69	1

Which statement is true with this given set of data?

A. median = mode **B.** median < mode

C. mean = mode **D.** mean < median

9. In order to determine the number of hours of homework that a grade 10 student at Cedar Valley School does each week Elaine selects a random sample of 25 grade 10 students at the school and asks them to fill out a survey. Identify the population.

A. the 25 students selected

B. the students in grade 10 at Cedar Valley School

C. the students in Elaine's grade 10 class at Cedar Valley School

D. all the grade 10 students in the school district

10. A study claims that one out of four elementary students go to school without eating breakfast.

Which of the following are questions that should be asked to detect any flaws in the data?

I. Do they eat lunch?

II. Did the study include public and private high schools?

III. Does the survey include adults?

IV. How many people were surveyed?

A. I only **B.** II only

C. II and IV only **D.** I, II, III and IV

11. Which of the following is an example of systematic sampling?

A. A radio station collects sales figures from two randomly chosen music stores in the area.

B. The first 5 numbers called in a BINGO game are selected by drawing balls from a rotating bin in which all the numbers have been place.

C. In order to collect information about students living in residence, the university selects 10 floors from the 180.

D. In order to determine the percentage of firecrackers that are do not work, the manufacturer fires off every 1000th firecracker produced.

12. A survey of 1 million subscribers to a teen magazine found that 85% use the Internet to download music. Which of the following statements is reasonable when trying to determine the percentage of people in the United States that download music from the Internet?

A. 85% is a good estimate of the number of people in the United States who download music from the Internet.

B. The percentage will be more than 85% because the survey was done on a small sample of United States residents.

C. The percentage will be less because the total population of the United States does not know how to download music from the Internet.

D. A conclusion is not possible because you can't relate the population of the United States to the teen magazine subscribers.

13. Which of the following samples are biased?

I. To find out how long it takes to travel to school, students who walk to school are interviewed.

II. A TV news show invites viewers to vote on a news topic. Viewers telephone one number to vote "yes" and another to vote "no".

III. To determine which ten favorite songs should be played at a school dance, the student council asks members of the school band.

IV. To determine which ten favorite songs should be played at a school dance, the student council asks 30 students randomly selected from the grade 12 class.

V. To determine which ten favorite songs should be played at a school dance, the student council asks 30 students randomly selected from the students registered at the school.

A. I only **B.** I and II only

C. II and V only **D.** I, II, III and IV

14. In your opinion which sampling method provides the worst representation of the population. Explain your answer.

15. A restaurant decided to include customer input in deciding on a new menu. Questionnaires were left on each table and customers were asked to fill them out and return them at their convenience.

a) What kind of sample did the restaurant use?

b) What people would not be represented in this sample?

c) What biases might occur in this sample?

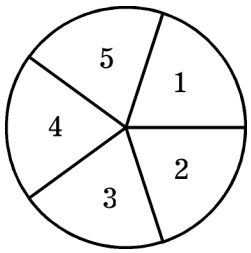
d) What alternative sampling methods could the restaurant use?

16. The figure shows the face of a spinner. The numbers are all equally likely to occur.

What is the probability that the pointer will land on an even number first, then on an odd number twice?

A. $\frac{1}{8}$ **B.** $\frac{1}{5}$

C. $\frac{12}{125}$ **D.** $\frac{18}{125}$



17. About 10% of the population of birds will show a positive result to a test for a certain stomach bacteria. Of the birds that test positive, only 96% actually have the bacteria. Of the birds that test negative, only 0.5% actually have the bacteria. What is the probability that a bird that tests negative actually has the bacteria?

A. 0.0085 **B.** 0.0045

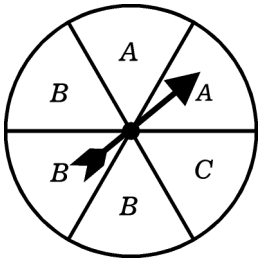
C. 0.47 **D.** 0.85

18. Suppose the warranty period on your family's new computer is about to expire and you are debating about whether to buy a one-year maintenance contract for $130. If you buy the contract, all repairs for one year are free. Consumer information shows that 23% of the computers like yours require an annual repair that costs $320 on the average. What is the expected value of buying the maintenance contract?

A. $29.90 **B.** −$13.90

C. −$56.40 **D.** $73.60

19. A game is played by spinning the spinner once. The table shows the possible results.



if the spinner . . .	then the player . . .
lands on A	wins $8
lands on B	loses $9
lands on C	wins $12

If Francine plays the game 100 times, how much money should she expect to end up with?

A. −$33.67 **B.** $16.67

C. $19,84 **D.** $28.33

20. You have 7 green balls and 7 red balls and two empty boxes. How should the balls be arranged in the two boxes in order to maximize the probability of drawing a green ball and what is this probability?

21. A factory claims that the weekly wages of the workers are normally distributed with a mean of \$1,700 and a standard deviation is \$45. Forty-five workers are surveyed and the average wage is found to be \$1,800. At $\alpha = 0.10$, what is the confidence interval between which the income of the sample must fall to accept the factory's claim?

A. between \$1,687 and \$1,713

B. between \$1,689 and \$1,711

C. between \$1,684 and \$1,716

D. between \$1,671 and \$1,729

22. In testing the hypothesis that a coin is fair the following rule is adopted: we will accept the hypothesis if the number of heads in a single sample of 300 is between 135 and 165 inclusive.

a) What is the probability of getting between 135 and 165 heads in a sample of 300 tosses?

b) What is the probability of rejecting the hypothesis when it is correct?

23. An investor is interested in purchasing an apartment building containing six apartments. The current owner provides the following probability distribution indicating the probability that the given number of apartments will be rented during a given month.

Apartments Rented	0	1	2	3	4	5	6
Probability	0.02	0.08	0.10	0.12	0.15	0.25	0.28

a) Find the number of apartments the investor could expect to be rented during a given month.

b) If the monthly rent for each apartment is \$600, how much could the investor expect to collect in rent for the whole building during a given month?

Problem-Attic Sample Document
all items from Virginia SOL Math Database

Probability and Statistics

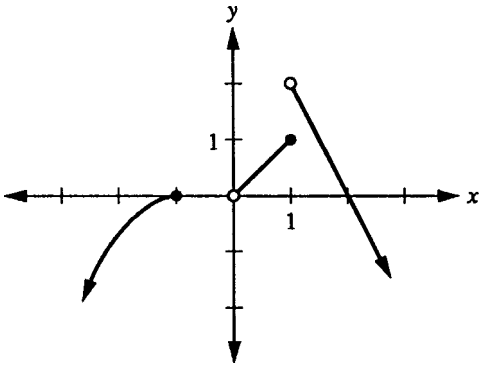
Num	Scoring	Standard	Answer
1	C	PS.02	\$32, \$33
2	D	PS.03	The population increase was about four times greater in the West than in the Midwest.
3		PS.03	Machine A makes more pencils within the desired range
4	C	PS.04	I and III only
5	B	PS.05	-18
6	B	PS.05	2.098623
7		PS.05	$y = 2.71x + 4.66$, 20.92 or 20,920,000.
8	A	PS.07	median = mode
9	B	PS.08	the students in grade 10 at Cedar Valley School
10	C	PS.08	II and IV only
11	D	PS.09	In order to determine the percentage of firecrackers that are do not work, the manufacturer fires off every 1000th firecracker produced.
12	C	PS.09	The percentage will be less because the total population of the United States does not know how to download music from the Internet.
13	D	PS.09	I, II, III and IV
14		PS.09	[answers vary]
15		PS.09	[answers vary]
16	D	PS.12	$\frac{18}{125}$
17	B	PS.12	0.0045
18	C	PS.12	$-\$56.40$
19	B	PS.12	\$16.67
20		PS.12	6 green and 7 red in one box and the last green in the other box, $\frac{19}{26}$
21	B	PS.17	between \$1,689 and \$1,711
22		PS.18	0.916, 0.0840
23		PS.19	4.17, \$2502

1. What is the domain of $y = x^2 - 3$ so that its inverse is also a function?

A. $x \geq 3$ **B.** $x \geq -3$

C. $x \leq 0$ **D.** all real numbers

2.



Given the graph, find the domain and range.

3. Assume you have arrived at the term $165x^8y^3$ in the binomial expansion of $(x + y)^n$, and you have not made any mistakes. What is the next term?

A. $330x^7y^4$ **B.** $330x^9y^2$

C. $55x^7y^4$ **D.** $440x^7y^4$

4. $\sum_{i=0}^{\infty} 4\left(\frac{5}{4}\right)^i = ?$

A. -20 **B.** -16

C. 16 **D.** series diverges

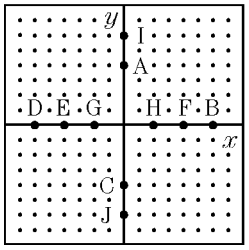
5. If the equation $16x^2 + 4y^2 = 64$ were graphed below on the grid, through what four points would it pass?

A. A, B, C, D

B. A, H, C, G

C. I, H, J, G

D. I, B, J, D



6. What is the equation of the parabola with vertex $(-5, -1)$, that opens up, and is congruent to $y = -3x^2$?

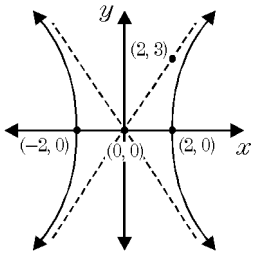
A. $y = 3(x - 5)^2 - 1$

B. $y = -3(x + 5)^2 - 1$

C. $y = 3(x + 5)^2 - 1$

D. $y = -3(x - 1)^2 - 5$

7. What is the equation of the given hyperbola?



A. $9x^2 + 4y^2 = 36$ **B.** $9x^2 - 4y^2 = -36$

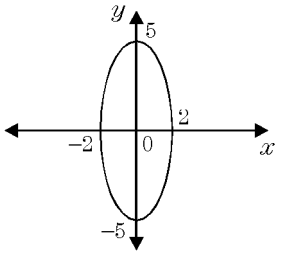
C. $9x^2 - 4y^2 = 36$ **D.** $4x^2 - 9y^2 = 36$

8. Automobile headlights have a parabolic shape. If the focus of a parabolic headlight is 3.81 cm from the vertex, how far from the vertex should the bulb be placed for optimal efficiency?

A. 0 cm **B.** 0.3 cm

C. 1.9 cm **D.** 3.81 cm

9. If the graph shown were translated 5 units to the left and 2 units up, what would its equation be?



10. If $2^{3x-1} = (\frac{1}{8})^2$, then what is the value of x?

A. $-\frac{7}{3}$ **B.** $-\frac{5}{3}$ **C.** $\frac{7}{3}$

D. no solution

11. In May, 1999, the population of a small town was 42,386 and was increasing at a rate of 0.9% per year. In what year will the town's population reach 50,000 at the same rate of growth?

A. 2009 **B.** 2010 **C.** 2016 **D.** 2017

12. Which one of the following is *not* equivalent to the others?

A. $10^{\log b} = 10^x$

B. $\log b = x \log 10$

C. $10^{\log x} = 10^b$

D. they are all equivalent

13. If $\log N = \log x + \log (y + 2) - 2 \log z$, then N is equal to:

A. $\dfrac{x(y + 2)}{2z}$ **B.** $\dfrac{x + (y + 2)}{z^2}$

C. $\dfrac{xy + 2x}{z^2}$ **D.** $x + (y + 2) - z^2$

14. *Newton's Law of Cooling* states that the difference in the temperature of a warm body and its cooler surroundings decreases exponentially. If you pour a cup of hot water at 90°C in a house where the temperature is 18°C the initial difference in temperatures is $72\,\text{C}^\circ$. This means that the difference in temperatures at time t is given by $D(t) = 72b^t$.

a) If the temperature of the hot water 4 minutes later is 60°C, then to 3 decimal places what is the value of b?

b) If the house stays at 18°C, then how long do you have to wait until the hot water cools to 50°C?

15. Given $\log_x A = 3$ and $\log_x B = 2$, evaluate:

a) $\log_x \dfrac{A}{B^3}$

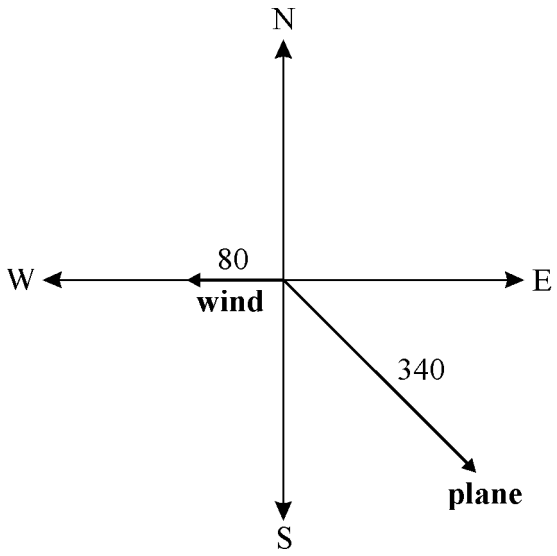
b) $\log_x AB^2$

16. Express $2(\cos 210^\circ + i \sin 210^\circ)$ in $a + bi$ form.

A. $-\sqrt{3} - i$ **B.** $\sqrt{3} + i$

C. $-\sqrt{3} + 2i$ **D.** $\sqrt{3} + 2i$

17. The diagram below represents a plane flying in a southeast direction at a velocity of 340 miles per hour. The wind is blowing from east to west at a velocity of 80 miles per hour. Find the velocity of the plane rounded to the nearest tenth of a mile per hour?



A. 285.6 **B.** 289.0

C. 289.8 **D.** 290.4

18. A point on the edge of a large rolling wheel is modeled by $x(t) = 4(t - \sin t)$ and $y(t) = 4(1 - \cos t)$, where x (horizontal displacement) and y (vertical displacement) are measured in feet, and t in seconds. About how much time elapses from one touch of the ground to the next touch of the ground for this point?

A. 2.4 sec **B.** 3.1 sec

C. 6.0 sec **D.** 6.3 sec

19. Simplify:

$$\begin{bmatrix} 1 \\ -2 \\ 3 \end{bmatrix} + 2\begin{bmatrix} 0 \\ 5 \\ -1 \end{bmatrix} - \begin{bmatrix} 1 \\ 2 \\ 0 \end{bmatrix} + 3\begin{bmatrix} 0 \\ 4 \\ -2 \end{bmatrix}$$

A. $\begin{bmatrix} 1 \\ 22 \\ -6 \end{bmatrix}$ **B.** $\begin{bmatrix} 0 \\ 18 \\ 6 \end{bmatrix}$

C. $\begin{bmatrix} 0 \\ 18 \\ -5 \end{bmatrix}$ **D.** undefined

20. Given the matrices, find the value of BC.

$$B = \begin{bmatrix} -1 & 2 \\ 7 & 5 \end{bmatrix} \quad C = \begin{bmatrix} -1 & -9 \\ 0 & 9 \\ -2 & -3 \end{bmatrix}$$

A. not defined

B. $\begin{bmatrix} 1 & 0 & -1 \\ 3 & -4 & 12 \end{bmatrix}$

C. $\begin{bmatrix} -7 & -18 & -29 \\ -3 & 15 & 15 \end{bmatrix}$

D. $\begin{bmatrix} -12 & 10 & 21 \\ -30 & 25 & 24 \end{bmatrix}$

21. A luxury car rental company rents four different types of cars, BMW, Jaguar, Mercedes and Lexus from three different rental locations. The company's rentals for March are summarized in the table.

	BMW	Jaguar	Mercedes	Lexus
Location I	177	88	622	0
Location II	355	266	355	0
Location III	355	355	355	266

The car rental company charge for one day is \$14 for a BMW, \$16 for a Jaguar, \$17 for a Mercedes, and \$20 for a Lexus.

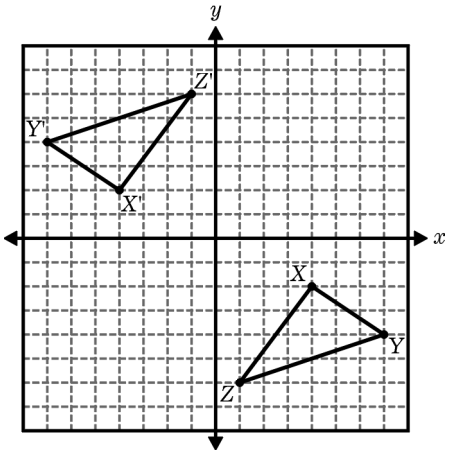
The data could be summarized using the following matrices:

$$M = \begin{bmatrix} 177 & 88 & 622 & 0 \\ 355 & 266 & 355 & 0 \\ 355 & 355 & 355 & 266 \end{bmatrix} \quad N = \begin{bmatrix} 177 & 355 & 355 \\ 88 & 266 & 355 \\ 622 & 355 & 355 \\ 0 & 0 & 266 \end{bmatrix} \quad A = \begin{bmatrix} 14 & 16 & 17 & 20 \end{bmatrix} \quad B = \begin{bmatrix} 14 \\ 16 \\ 17 \\ 20 \end{bmatrix}$$

Which of the following matrix products could be used to find the total revenue at each location in March?

A. AM **B.** BM **C.** BN **D.** AN

22.



Which matrix calculation was used to transform $\triangle XYZ$ to $\triangle X'Y'Z'$?

A. $\begin{bmatrix} 0 & -1 \\ 1 & 0 \end{bmatrix}\begin{bmatrix} 4 & 7 & 1 \\ 2 & 4 & 6 \end{bmatrix}$

B. $\begin{bmatrix} -1 & 0 \\ 0 & -1 \end{bmatrix}\begin{bmatrix} 4 & 7 & 1 \\ -2 & -4 & -6 \end{bmatrix}$

C. $\begin{bmatrix} -1 & 0 \\ 0 & 1 \end{bmatrix}\begin{bmatrix} 4 & 7 & 1 \\ -2 & -4 & -6 \end{bmatrix}$

D. $\begin{bmatrix} 0 & -1 \\ -1 & 0 \end{bmatrix}\begin{bmatrix} 4 & 7 & 1 \\ -2 & -4 & -6 \end{bmatrix}$

23. Given Matrix A and Matrix B, find $[X]$

$[A]X = [B]$

Matrix A $= \begin{bmatrix} 1 & 2 & 1 \\ -1.5 & -3 & 1.75 \\ 0 & 0.1 & 0.5 \end{bmatrix}$

Matrix B $= \begin{bmatrix} 12 & 6 \\ -6 & 42 \\ -15 & 4 \end{bmatrix}$

A. $\begin{bmatrix} 14 & -18 \\ 98 & 39 \\ 204 & 48 \end{bmatrix}$

B. $\begin{bmatrix} -18 & 39 & 48 \\ 14 & 98 & 204 \end{bmatrix}$

C. $\begin{bmatrix} -18 & 14 \\ 39 & 98 \\ 48 & 204 \end{bmatrix}$

D. none of these

24. A system of linear equations is to be solved by Cramer's Rule. What is the missing value in the solution?

$2x - y = -10$
$x + 3y = 2$

$$y = \frac{\square}{\begin{vmatrix} 2 & -1 \\ 1 & 3 \end{vmatrix}}$$

A. -7 **B.** 7 **C.** 14 **D.** 21

25. Solve using Gaussian elimination with back substitution or Gauss-Jordan elimination:

$$\begin{aligned} x + 2y + 5z &= 5 \\ x + y + 2z &= 1 \\ x - 4z &= -9 \end{aligned}$$

A. $(1, 4, 0)$ **B.** $(-1, -2, 2)$

C. $(-1, 3, 1)$ **D.** $(-3, -3, 2)$

26. Two slices of apple pie and 3 cookies cost \$6. Three slices of apple pie and 5 cookies cost \$8. Which equation could be used to find the individual costs of a slice of apple pie (a) and a cookie (c)?

A. $\begin{bmatrix} a \\ c \end{bmatrix} = \begin{bmatrix} 5 & -3 \\ -3 & 2 \end{bmatrix} \begin{bmatrix} 6 \\ 8 \end{bmatrix}$

B. $\begin{bmatrix} a \\ c \end{bmatrix} = \begin{bmatrix} 5 & 3 \\ -3 & 2 \end{bmatrix} \begin{bmatrix} 6 \\ 8 \end{bmatrix}$

C. $\begin{bmatrix} a \\ c \end{bmatrix} = \begin{bmatrix} 2 & 3 \\ 3 & 5 \end{bmatrix} \begin{bmatrix} 6 \\ 8 \end{bmatrix}$

D. $\begin{bmatrix} a \\ c \end{bmatrix} = \begin{bmatrix} 6 \\ 8 \end{bmatrix} \begin{bmatrix} 2 & 3 \\ 3 & 5 \end{bmatrix}$

Problem-Attic Sample Document
all items from Virginia SOL Math Database

Mathematical Analysis

Num	Scoring	Standard	Answer
1	C	MA.02	$x \leq 0$
2		MA.03	D: $x \leq -1,\ x > 0$; R: $y < 2$
3	A	MA.04	$330x^7y^4$
4	D	MA.05	series diverges
5	B	MA.08	A, H, C, G
6	C	MA.08	$y = 3(x+5)^2 - 1$
7	C	MA.08	$9x^2 - 4y^2 = 36$
8	D	MA.08	3.81 cm
9		MA.08	$\frac{(x+5)^2}{4} + \frac{(y-2)^2}{25} = 1$
10	B	MA.09	$-\frac{5}{3}$
11	D	MA.09	2017
12	C	MA.09	$10^{\log x} = 10^b$
13	C	MA.09	$\frac{xy + 2x}{z^2}$
14		MA.09	$b \approx 0.874;\ t \approx 6.0$ min
15		MA.09	$-3;\ 7$
16	A	MA.10	$-\sqrt{3} - i$
17	B	MA.11	289.0
18	D	MA.12	6.3 sec
19	C	MA.14	$\begin{bmatrix} 0 \\ 18 \\ -5 \end{bmatrix}$
20	A	MA.14	not defined
21	B	MA.14	BM
22	B	MA.14	$\begin{bmatrix} -1 & 0 \\ 0 & -1 \end{bmatrix}\begin{bmatrix} 4 & 7 & 1 \\ -2 & -4 & -6 \end{bmatrix}$
23	C	MA.14	$\begin{bmatrix} -18 & 14 \\ 39 & 98 \\ 48 & 204 \end{bmatrix}$
24	C	MA.14	14
25	B	MA.14	$(-1, -2, 2)$
26	A	MA.14	$\begin{bmatrix} a \\ c \end{bmatrix} = \begin{bmatrix} 5 & -3 \\ -3 & 2 \end{bmatrix}\begin{bmatrix} 6 \\ 8 \end{bmatrix}$