
MATHEMATICS ITEMS

Guide to the Content and Layout of This Book

The *Mathematics Items* book contains, in a ready-to-use form, the released TIMSS 1999 and TIMSS 2003 mathematics assessment items that appeared in Book 3, *Mathematics Concepts and Mathematics Items*. Each item is presented on a separate page to facilitate printing.

The two books are designed to be used in tandem. The *Mathematics Items* book is designed to facilitate the construction of sets of items tailored to the purpose of the user—most likely a classroom teacher. Users can select items for their own purpose based on their reading of the *Mathematics Concepts and Mathematics Items* book, print these and administer them to students. Student responses can be scored using the scoring instructions presented in the *Mathematics Concepts and Mathematics Items* book, and may be compared to the international benchmarks presented there.

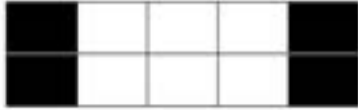
If there are 300 calories in 100 g of a certain food, how many calories are there in a 30 g portion of this food?

- A. 90
- B. 100
- C. 900
- D. 1000
- E. 9000

Item Number: B08

Which picture shows that $\frac{2}{5}$ is equivalent to $\frac{4}{10}$?

A.



B.



C.



D.



Item Number: B09

Which of these is the smallest number?

A. 0.625

B. 0.25

C. 0.375

D. 0.5

E. 0.125

Item Number: B10

Which of these fractions is smallest?

A. $\frac{1}{6}$

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

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

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

Item Number: D09



What is the best estimate of the number corresponding to P?

- A. 1.1
- B. 1.2
- C. 1.4
- D. 1.5

Item Number: D12

A runner ran 3000 m in exactly 8 minutes. What was his average speed in meters per second?

A. 3.75

B. 6.25

C. 16.0

D. 37.5

E. 62.5

Item Number: F07

Which of these numbers is between 0.07 and 0.08?

A. 0.00075

B. 0.0075

C. 0.075

D. 0.75

Item Number: F09

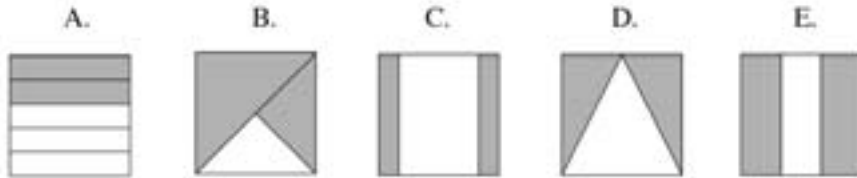
What fraction of the circle is shaded?

- A. Between 0 and $\frac{1}{4}$
- B. Between $\frac{1}{4}$ and $\frac{1}{2}$
- C. Between $\frac{1}{2}$ and $\frac{3}{4}$
- D. Between $\frac{3}{4}$ and 1



Item Number: F12

Which shows $\frac{2}{3}$ of the square shaded?



Item Number: H08

The sum $691 + 208$ is closest to the sum

A. $600 + 200$

B. $700 + 200$

C. $700 + 300$

D. $900 + 200$

Item Number: H09

Divide: $\frac{6}{55} \div \frac{3}{25} =$

Answer: _____

Item Number: J12

Divide $0.003 \overline{)15.45}$

A. 0.515

B. 5.15

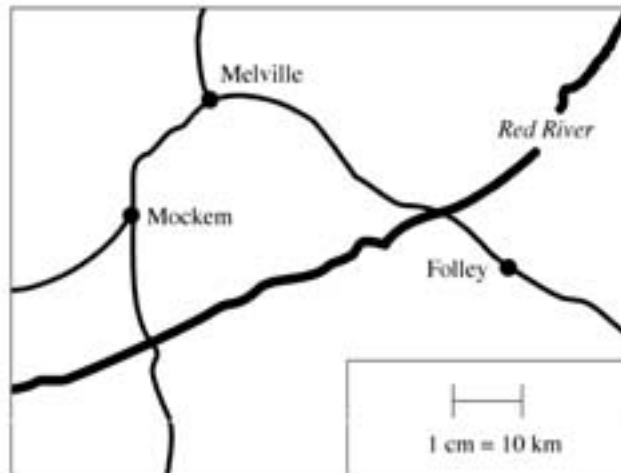
C. 51.5

D. 515

E. 5150

Item Number: J14

On the map, 1 cm represents 10 km on the land.



On the land, about how far apart are the towns Melville and Folley?

- A. 5 km
- B. 30 km
- C. 40 km
- D. 50 km

Item Number: J18



The car is 3.5 m long. About how long is the building?

- A. 18 m
- B. 14 m
- C. 10 m
- D. 4 m

Item Number: L09

Which number is two hundred six and nine-tenths?

A. 206.09

B. 206.9

C. 206.910

D. 2006.9

Item Number: L10

What is the value of $\frac{4}{5} - \frac{1}{3} - \frac{1}{15}$?

A. $\frac{1}{5}$

B. $\frac{2}{5}$

C. $\frac{7}{15}$

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

E. $\frac{4}{5}$

Item Number: L18

A company produced 17,175 cars in 1996. For a report, this number was rounded to the nearest hundred. Which was the number of cars given in the report?

- A. 17,000
- B. 17,100
- C. 17,200
- D. 17,270

Item Number: N11

In which list of fractions are all of the fractions equivalent?

A. $\frac{1}{2}$, $\frac{2}{4}$, $\frac{4}{6}$

B. $\frac{2}{3}$, $\frac{4}{6}$, $\frac{8}{12}$

C. $\frac{2}{5}$, $\frac{4}{10}$, $\frac{8}{50}$

D. $\frac{3}{4}$, $\frac{4}{6}$, $\frac{6}{8}$

Item Number: N14

Penny had a bag of marbles. She gave one-third of them to Rebecca, and then one-fourth of the remaining marbles to John. Penny then had 24 marbles left in the bag. How many marbles were in the bag to start with?

- A. 36
- B. 48
- C. 60
- D. 96

Item Number: N16

A painter had 25 L of paint. He used 2.5 L of paint every hour. He finished the job in 5.5 hours. How much paint did he have left?

A. 10.25 L

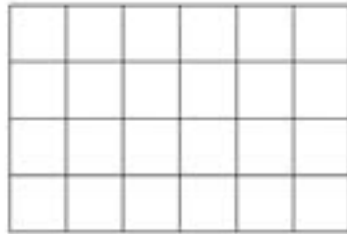
B. 11.25 L

C. 12.75 L

D. 13.75 L

Item Number: N17

Shade in $\frac{3}{8}$ of the unit squares in the grid.



Item Number: N19

There are 68 rows of cars in a parking lot. Each row has 92 cars. Which of these would give the closest estimate of the total number of cars in the parking lot?

A. $60 \times 90 = 5400$

B. $60 \times 100 = 6000$

C. $70 \times 90 = 6300$

D. $70 \times 100 = 7000$

Item Number: P13

Sound travels at approximately 330 meters per second. The sound of an explosion took 28 seconds to reach a person. Which of these is the closest estimate of how far away the person was from the explosion?

- A. 12,000 m
- B. 9,000 m
- C. 8,000 m
- D. 6,000 m

Item Number: P14

Robin and Jim took cherries from a basket. Robin took $\frac{1}{3}$ of the cherries and Jim took $\frac{1}{6}$ of the cherries. What fraction of the cherries remained in the basket?

A. $\frac{1}{2}$

B. $\frac{1}{3}$

C. $\frac{1}{6}$

D. $\frac{1}{18}$

Item Number: P15

Write 0.48 as a fraction reduced to its lowest terms.

Answer: _____

Item Number: P17

Subtract: $4.722 - 1.935 =$

A. 2.787

B. 2.797

C. 2.887

D. 2.897

Item Number: R07

The total weight of a pile of 500 salt crystals is 6.5 g. What is the average weight of a salt crystal?

- A. 0.0078 g
- B. 0.013 g
- C. 0.0325 g
- D. 0.078 g

Item Number: R08

Subtract:
$$\begin{array}{r} 7003 \\ - 4078 \\ \hline \end{array}$$

- A. 2035
- B. 2925
- C. 3005
- D. 3925

Item Number: R13

Laura had \$240. She spent $\frac{5}{8}$ of it. How much money did she have left?

Answer: _____

Item Number: R14

John sold 60 magazines and Mark sold 80 magazines. The magazines were all sold for the same price. The total amount of money received for the magazines was \$700. How much money did Mark receive?

Answer: _____

Item Number: R15

A book publisher sent 140 copies of a certain book to a bookstore. The publisher packed the books in two types of boxes. One type of box held 8 copies of the book, and the other type of box held 12 copies of the book. The boxes were all full, and there were equal numbers of both types of boxes.

a) How many boxes holding 12 books were sent to the bookstore?

Answer: _____

b) What fraction of the books sent to the bookstore were packed in the smaller boxes?

Answer: _____

Item Number: T02A

A book publisher sent 140 copies of a certain book to a bookstore. The publisher packed the books in two types of boxes. One type of box held 8 copies of the book, and the other type of box held 12 copies of the book. The boxes were all full, and there were equal numbers of both types of boxes.

a) How many boxes holding 12 books were sent to the bookstore?

Answer: _____

b) What fraction of the books sent to the bookstore were packed in the smaller boxes?

Answer: _____

Item Number: T02B

A sheet of paper is 0.012 cm thick. Of the following, which would be the height of a stack of 400 sheets of this paper?

A. 0.048 cm

B. 0.48 cm

C. 4.8 cm

D. 48 cm

Item Number: T04

The height of a boy was reported as 140 cm. The height had been rounded to the nearest 10 cm. What are two possibilities for the boy's actual height?

Answer: _____ cm and _____ cm

Item Number: V01

In making a garden fertilizer, a gardener mixes 2 kg of a nitrate, 3 kg of a phosphate, and 6 kg of potash. What is the ratio of nitrate to the total amount of fertilizer?

A. $\frac{11}{9}$

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

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

D. $\frac{2}{11}$

Item Number: V03

n is a number. When n is multiplied by 7, and 6 is then added, the result is 41. Which of these equations represents this relation?

A. $7n + 6 = 41$

B. $7n \pm 6 = 41$

C. $7n \times 6 = 41$

D. $7(n + 6) = 41$

Item Number: B12

If the ratio 7 to 13 is the same as the ratio x to 52, what is the value of x ?

- A. 7
- B. 13
- C. 28
- D. 364

Item Number: D08

The cost, C , of printing greeting cards consists of a fixed charge of 100 cents and a charge of 6 cents for each card printed. Which of these equations can be used to determine the cost of printing n cards?

A. $C = (100 + 6n)$ cents

B. $C = (106 + n)$ cents

C. $C = (6 + 100n)$ cents

D. $C = (106n)$ cents

E. $C = (600n)$ cents

Item Number: D10

If 4 times a number is 48, what is $\frac{1}{3}$ of the number?

- A. 4
- B. 8
- C. 12
- D. 16

Item Number: F11

The table shows a relation between x and y .

x	2	3	4	5
y	7	10	13	16

Which of these equations expresses this relation?

A. $y = x + 5$

B. $y = x \pm 5$

C. $y = \frac{1}{3}(x \pm 1)$

D. $y = 3x + 1$

Item Number: H10

\square represents the number of magazines that Lina reads each week. Which of these represents the total number of magazines that Lina reads in 6 weeks?

- A. $6 + \square$
- B. $6 \times \square$
- C. $\square + 6$
- D. $(\square + \square) \times 6$

Item Number: H12

The table represents a relation between x and y .

What is the missing number in the table?

- A. 9
- B. 10
- C. 11
- D. 12
- E. 13

x	y
2	5
3	7
4	?
7	15

Item Number: J17

In a sequence of starts and stops, an elevator travels from the first floor to the fifth floor and then to the second floor. From there, the elevator travels to the fourth floor and then to the third floor. If the floors are 3 m apart, how far has the elevator traveled?

- A. 18 m
- B. 27 m
- C. 30 m
- D. 45 m

Item Number: L12

The table represents a relation between x and y .

Which of the following equations could represent the same relation?

A. $y = 2x + 2$

B. $y = 2x - 1$

C. $y = 3x + 2$

D. $y = 3x + 1$

E. $y = 3x - 2$

x	y
1	1
2	4
3	7
4	10

Item Number: L14

The table shows some values of x and y , where x is proportional to y .

x	4	8	Q
y	9	P	45

What are the values of P and Q ?

- A. $P = 40$ and $Q = 13$
- B. $P = 18$ and $Q = 17$
- C. $P = 20$ and $Q = 18$
- D. $P = 40$ and $Q = 18$
- E. $P = 18$ and $Q = 20$

Item Number: L15

Find the value of x if $12x - 10 = 6x + 32$

Answer: _____

Item Number: L17

If $x = 3$, what is the value of $\frac{5x + 3}{4x - 3}$?

Answer: _____

Item Number: N13

Which of these expressions is equivalent to $n \times n \times n$ for all values of n ?

A. $\frac{n}{3}$

B. $n + 3$

C. $3n$

D. n^3

Item Number: P09

For all numbers k ,
 $k + k + k + k + k$ can be written as

- A. $k + 5$
- B. $5k$
- C. k^5
- D. $5(k + 1)$

Item Number: P11

Which of the following is true when a , b , and c are different real numbers?

A. $a - b = b - a$

B. $a(b - c) = b(c - a)$

C. $b - c = c - b$

D. $ab = ba$

E. $ab - c = ab - b$

Item Number: R10

If k represents a negative number, which of these is a positive number?

A. k^2

B. k^3

C. $2k$

D. $\frac{k}{2}$

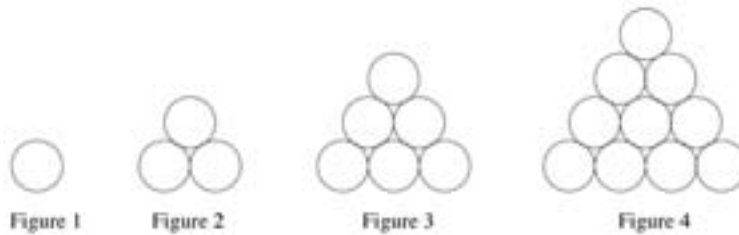
Item Number: R12

A club has 86 members, and there are 14 more girls than boys.
How many boys and how many girls are members of the club?

Show your work.

Item Number: T01

The figures show four sets consisting of circles.



- a) Complete the table below. First, fill in how many circles make up Figure 4. Then, find the number of circles that would be needed for the 5th figure if the sequence of figures is extended.

Figure	Number of circles
1	1
2	3
3	6
4	
5	

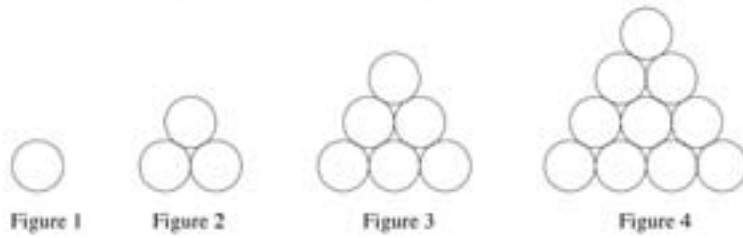
- b) The sequence of figures is extended to the 7th figure. How many circles would be needed for Figure 7?

Answer: _____

- c) The 50th figure in the sequence contains 1275 circles. Determine the number of circles in the 51st figure. Without drawing the 51st figure, explain or show how you arrived at your answer.

Item Number: V04A

The figures show four sets consisting of circles.



- a) Complete the table below. First, fill in how many circles make up Figure 4. Then, find the number of circles that would be needed for the 5th figure if the sequence of figures is extended.

Figure	Number of circles
1	1
2	3
3	6
4	
5	

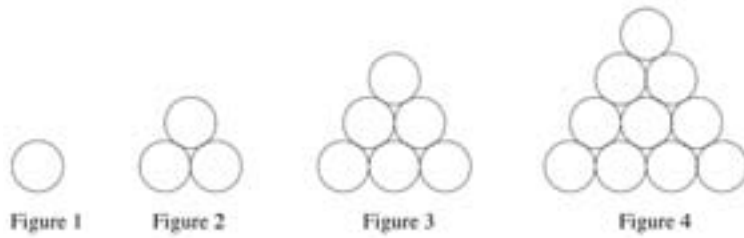
- b) The sequence of figures is extended to the 7th figure. How many circles would be needed for Figure 7?

Answer: _____

- c) The 50th figure in the sequence contains 1275 circles. Determine the number of circles in the 51st figure. Without drawing the 51st figure, explain or show how you arrived at your answer.

Item Number: V04B

The figures show four sets consisting of circles.



- a) Complete the table below. First, fill in how many circles make up Figure 4. Then, find the number of circles that would be needed for the 5th figure if the sequence of figures is extended.

Figure	Number of circles
1	1
2	3
3	6
4	
5	

- b) The sequence of figures is extended to the 7th figure. How many circles would be needed for Figure 7?

Answer: _____

- c) The 50th figure in the sequence contains 1275 circles. Determine the number of circles in the 51st figure. Without drawing the 51st figure, explain or show how you arrived at your answer.

Item Number: V04C

What units would be best to use to measure the weight (mass) of an egg?

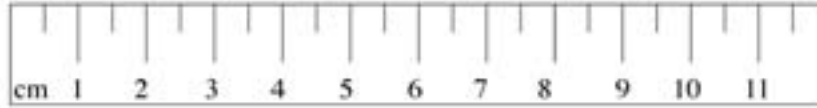
A. centimeters

B. milliliters

C. grams

D. kilograms

Item Number: D11

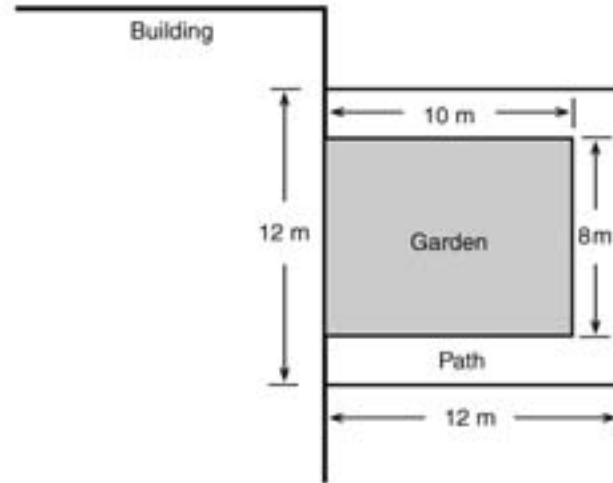


Using a centimeter ruler like this one, you can measure accurately to the nearest

- A. millimeter
- B. half-millimeter
- C. centimeter
- D. half-centimeter

Item Number: F10

A rectangular garden that is next to a building has a path around the other three sides, as shown.



What is the area of the path?

- A. 144 m^2
- B. 64 m^2
- C. 44 m^2
- D. 16 m^2

Item Number: J10

Four girls measured the length of their paces. The chart shows their measurements.

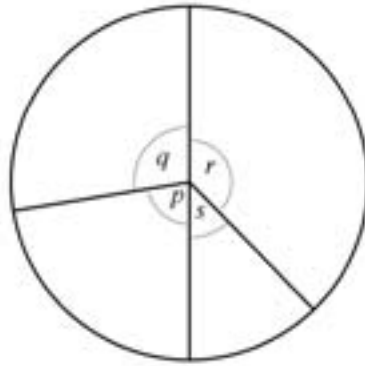
Name	Length of Pace
Polly	80 cm
Maria	65 cm
Helen	75 cm
Susan	60 cm

Who would take the most paces in walking from one end of a hallway to the other?

- A. Polly
- B. Maria
- C. Helen
- D. Susan

Item Number: L13

Which angle in the figure has a measure closest to 45° ?



- A. p
- B. q
- C. r
- D. s

Item Number: N15

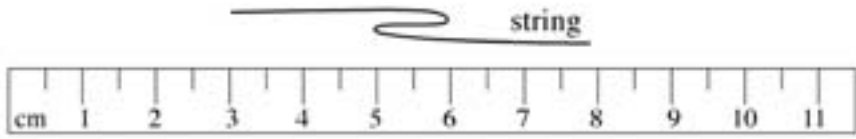
The rectangle below is twice as long as it is wide.



What is the ratio of the width of the rectangle to its perimeter?

- A. $\frac{1}{2}$
- B. $\frac{1}{3}$
- C. $\frac{1}{4}$
- D. $\frac{1}{6}$

Item Number: P08

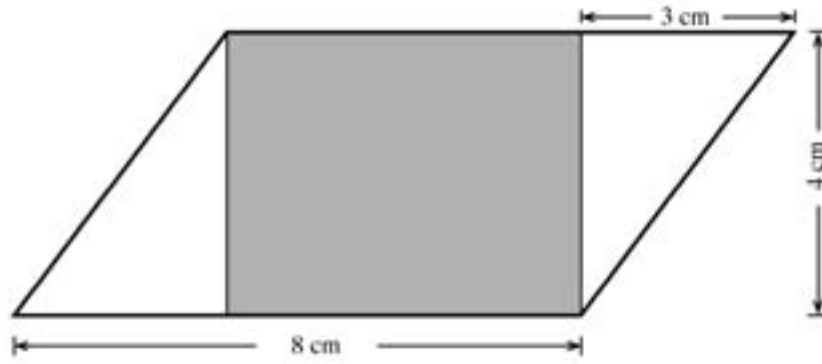


If the string in the diagram is pulled straight, which of these is closest to its length?

- A. 5 cm
- B. 6 cm
- C. 7 cm
- D. 8 cm

Item Number: P12

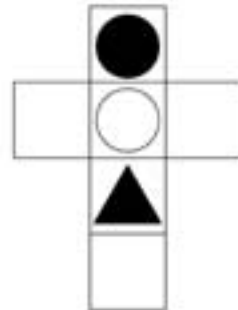
The figure shows a shaded rectangle inside a parallelogram.



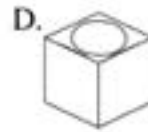
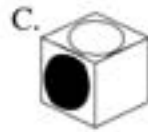
What is the area of the shaded rectangle?

Answer: _____

Item Number: T03



Which of these cubes could be made by folding the figure above?

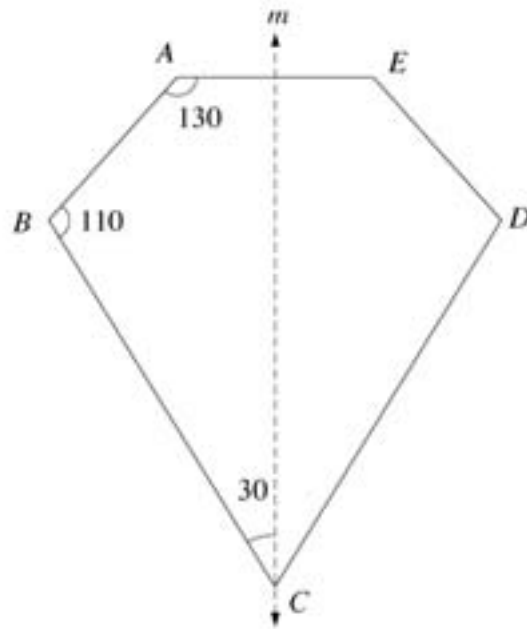


Item Number: B11

The line m is a line of symmetry for figure $ABCDE$.

The measure of angle BCD is

- A. 30°
- B. 50°
- C. 60°
- D. 70°
- E. 110°



Item Number: D07

Of the following, which is NOT true for all rectangles?

- A. The opposite sides are parallel.
- B. The opposite sides are equal.
- C. All angles are right angles.
- D. The diagonals are equal.
- E. The diagonals are perpendicular.

Item Number: J11

Two of the triangles below are similar.



I



II



III



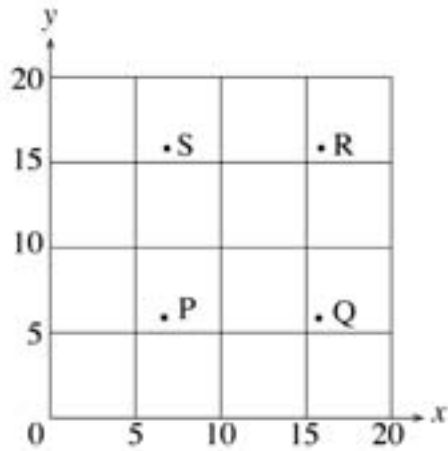
IV

Which two triangles are similar?

- A. I and II
- B. I and III
- C. I and IV
- D. II and IV
- E. III and IV

Item Number: J15

Which point on the graph could have coordinates (7,16)?



- A. Point P
- B. Point Q
- C. Point R
- D. Point S

Item Number: J16

In a quadrilateral, each of two angles has a measure of 115° . If the measure of a third angle is 70° , what is the measure of the remaining angle?

- A. 60°
- B. 70°
- C. 130°
- D. 140°
- E. None of the above

Item Number: L16

Point P (not shown) on the number line is 5 units from point N and 2 units from point M .

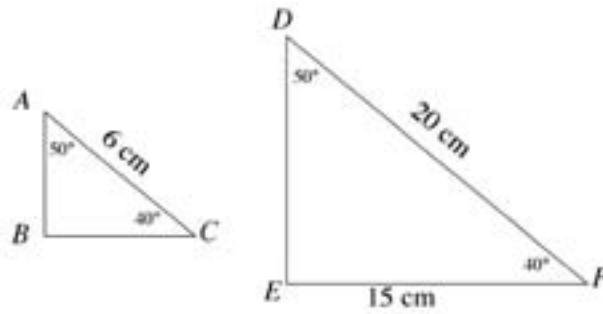


Where is point P located?

- A. Between O and L .
- B. Between L and M .
- C. Between M and N .
- D. To the right of N .

Item Number: N12


The figure represents two similar triangles. The triangles are not drawn to scale.



In the actual triangle ABC , what is the length of side BC ?

- A. 3.5 cm
- B. 4.5 cm
- C. 5 cm
- D. 5.5 cm
- E. 8 cm

Item Number: P10

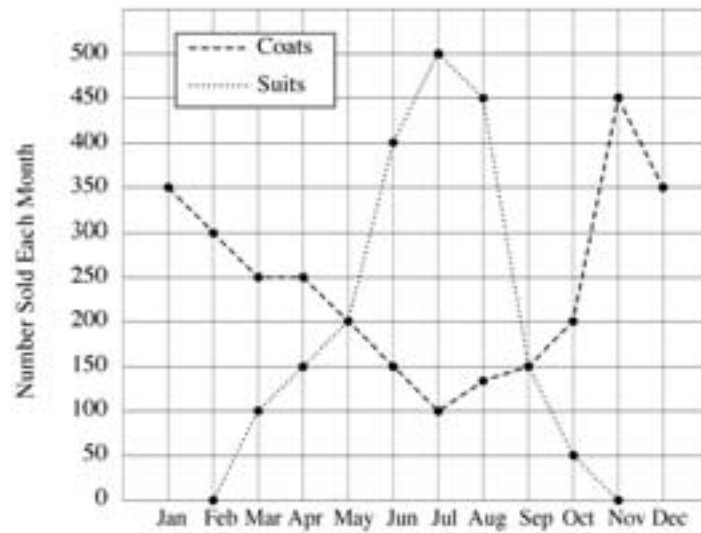


How many of the shaded right triangles shown above are needed to exactly cover the surface of the rectangle?

- A. Four
- B. Six
- C. Eight
- D. Ten

Item Number: R11

This graph shows the number of suits and coats sold each month.



According to the information in the graph, during which two-month period does the greatest increase in coat sales occur?

- A. December - January
- B. May - June
- C. June - July
- D. October - November

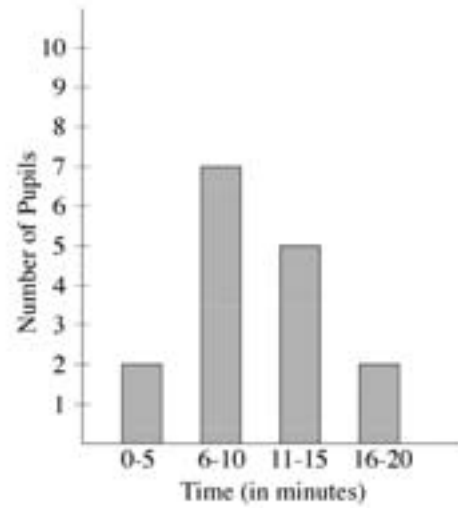
Item Number: B07

If a fair coin is tossed, the probability that it will land heads up is $\frac{1}{2}$. In four successive tosses, a fair coin lands heads up each time. What is likely to happen when the coin is tossed a fifth time?

- A. It is more likely to land tails up than heads up.
- B. It is more likely to land heads up than tails up.
- C. It is equally likely to land heads up or tails up.
- D. More information is needed to answer the question.

Item Number: F08

The graph shows the time of travel by pupils from home to school.



How many pupils must travel for MORE than 10 minutes?

- A. 2
- B. 5
- C. 7
- D. 8
- E. 15

Item Number: H07

From a batch of 3,000 light bulbs, 100 were selected at random and tested. If 5 of the light bulbs in the sample were found to be defective, about how many defective light bulbs would be expected in the entire batch?



- A. 15
- B. 60
- C. 150
- D. 300
- E. 600


Item Number: H11

The table shows the number of houses on two streets of a town, Konini Street and Rimu Street.

Street	Number of Houses
Konini	30
Rimu	21

The pictograph below represents the number of houses in each street.

Konini St.	
Rimu St.	

How many houses does one  represent?

Answer: _____

Item Number: J13

The graph below shows the humidity in a room as recorded on a certain morning.



On the morning shown in the graph, how many times between 6 a.m. and 12 noon was the humidity exactly 20 percent?

- A. One
- B. Two
- C. Three
- D. Four

Item Number: L11

The eleven chips shown below are placed in a bag and mixed.



Chelsea draws one chip from the bag without looking. What is the probability that Chelsea draws a chip with a number that is a multiple of three?

A. $\frac{1}{11}$

B. $\frac{1}{3}$

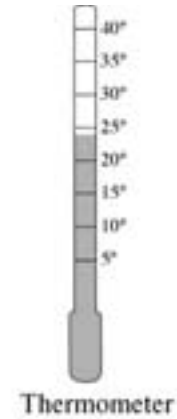
C. $\frac{4}{11}$

D. $\frac{4}{7}$

Item Number: N18

This table shows temperatures at various times on four days.

TEMPERATURE					
	6 a.m.	9 a.m.	Noon	3 p.m.	6 p.m.
Monday	15°	17°	24°	21°	16°
Tuesday	20°	16°	15°	10°	9°
Wednesday	8°	14°	16°	19°	15°
Thursday	8°	11°	19°	26°	20°

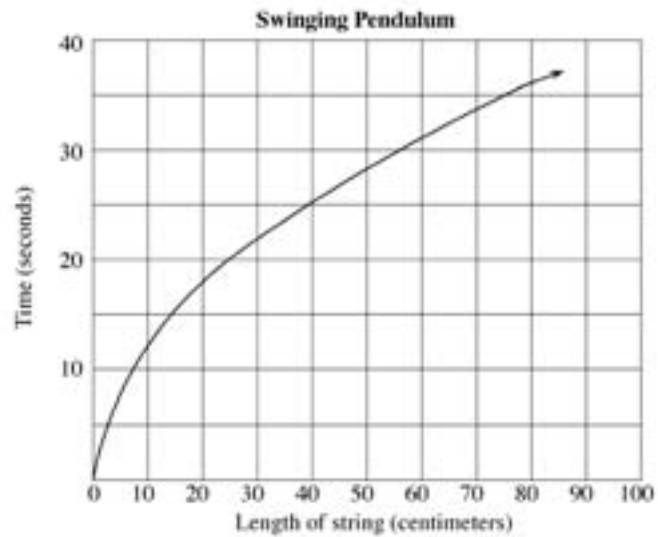


On which day and at what time was the temperature shown in the table the same as that shown on the thermometer?

- A. Monday, Noon
- B. Tuesday, 6 a.m.
- C. Wednesday, 3 p.m.
- D. Thursday, 3 p.m.

Item Number: P16

The graph shows the time taken for a pendulum to swing backwards and forwards 20 times for different lengths of the string.



The length of a string is 90 cm. About how long would it take for the pendulum to swing backwards and forwards 20 times?

- A. 35 seconds
- B. 38 seconds
- C. 42 seconds
- D. 45 seconds

Item Number: R09

Chris plans to order 24 issues of a magazine. He reads the following advertisements for two magazines. *Ceds* are the units of currency in Chris' country.

**Teen Life
Magazine**

24 issues
First four issues FREE
The rest
3 *ceds* each.

**Teen News
Magazine**

24 issues
First six issues FREE
The rest
3.5 *ceds* each.

Which magazine is the least expensive for 24 issues? How much less expensive? Show your work.

Item Number: V02

If $x = -3$, what is the value of $-3x$?

- (A) -9
- (B) -6
- (C) -1
- (D) 1
- (E) 9

Item Number: M012042

Subtract: $\frac{3x}{7} - \frac{x}{7} =$

(A) $\frac{2}{7}$

(B) 3

(C) $2x$

(D) $\frac{x}{7}$

(E) $\frac{2x}{7}$

Item Number: M022185

Which of these is equal to $2x - 3y + 7x + 5y$?

- (A) $5x + 2y$
- (B) $5x + 8y$
- (C) $9x + 2y$
- (D) $9x + 8y$

Item Number: M032036

If $a + 2b = 5$ and $c = 3$, what is the value of $a + 2(b + c)$?

Answer: _____

Item Number: M032557

Sam wanted to find three consecutive even numbers that add up to 84.
He wrote the equation $k + (k + 2) + (k + 4) = 84$.
What does the letter k represent?

- Ⓐ The least of the three even numbers
- Ⓑ The middle even number
- Ⓒ The greatest of the three even numbers
- Ⓓ The average of the three even numbers

Item Number: M022002

Graham has twice as many books as Bob. Chan has six more books than Bob. If Bob has x books, which of the following represents the total number of books the three boys have?

- (A) $3x + 6$
- (B) $3x + 8$
- (C) $4x + 6$
- (D) $5x + 6$
- (E) $8x + 2$

Item Number: M022251

Carla paid x zeds for 3 cartons of juice. What is the price in zeds of 1 carton of juice?

(A) $\frac{x}{3}$

(B) $\frac{3}{x}$

(C) $3 + x$

(D) $3x$

Item Number: M032044

If $\frac{12}{n} = \frac{36}{21}$, then n equals

- Ⓐ 3
- Ⓑ 7
- Ⓒ 36
- Ⓓ 63

Item Number: M012040

If $L = 4$ when $K = 6$ and $M = 24$, which of the following is true?

Ⓐ $L = \frac{M}{K}$

Ⓑ $L = \frac{K}{M}$

Ⓒ $L = KM$

Ⓓ $L = K + M$

Ⓔ $L = M - K$

Item Number: M022196

If $4(x + 5) = 80$, then $x =$

Answer: _____

Item Number: M022253

If $x + 3y = 11$ and $2x + 3y = 13$, then $y =$

- Ⓐ 3
- Ⓑ 2
- Ⓒ -2
- Ⓓ -3

Item Number: M032728

If $x - y = 5$ and $\frac{x}{2} = 3$, what is the value of y ?

- (A) 6
- (B) 1
- (C) -1
- (D) -7

Item Number: M032208

If $\frac{a}{b} = 70$, then $\frac{a}{2b} =$

- (A) 35
- (B) 68
- (C) 72
- (D) 140

Item Number: M032210

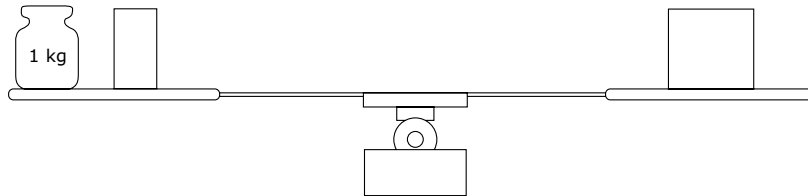
At a market, 7 oranges and 4 lemons cost 43 zeds, and 11 oranges and 12 lemons cost 79 zeds. Using x to represent the cost of an orange and y to represent the cost of a lemon, write two equations that could be used to find the values of x and y .

Equation 1: _____

Equation 2: _____

Item Number: M032545

The objects on the scale make it balance exactly. On the left pan there is a 1 kg weight (mass) and half a brick. On the right pan there is one brick.



What is the weight (mass) of one brick?

- (A) 0.5 kg
- (B) 1 kg
- (C) 2 kg
- (D) 3 kg

Item Number: M012002

If $y = 3x + 2$, which of these expresses x in terms of y ?

Ⓐ $x = \frac{y-2}{3}$

Ⓑ $x = \frac{y+2}{3}$

Ⓒ $x = \frac{y}{3} - 2$

Ⓓ $x = \frac{y}{3} + 2$

Item Number: M032046

Matchsticks are arranged as shown in the figures.

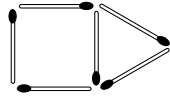


Figure 1

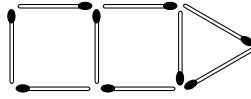


Figure 2

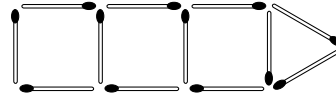


Figure 3

If the pattern is continued, how many matchsticks would be used to make Figure 10?

- (A) 30
- (B) 33
- (C) 36
- (D) 39
- (E) 42

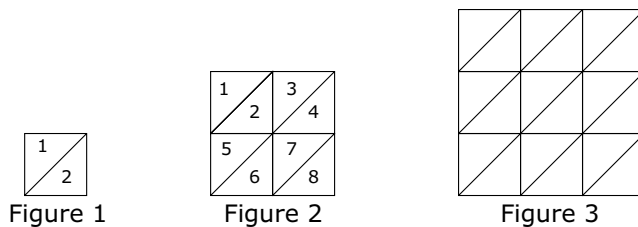
Item Number: M012017

The numbers in the sequence 7, 11, 15, 19, 23, ... increase by four. The numbers in the sequence 1, 10, 19, 28, 37, ... increase by nine. The number 19 is in both sequences. If the two sequences are continued, what is the next number that is in BOTH the first and the second sequences?

Answer: _____

Item Number: M022008

The three figures below are divided into small congruent triangles.



- A. Complete the table below. First, fill in how many small triangles make up Figure 3. Then, find the number of small triangles that would be needed for the 4th figure if the sequence of figures is extended.

Figure	Number of Small Triangles
1	2
2	8
3	
4	

- B. The sequence of figures is extended to the 7th figure. How many small triangles would be needed for Figure 7?

Answer: _____

- C. The sequence of figures is extended to the 50th figure. Explain a way to find the number of small triangles in the 50th figure that does not involve drawing it and counting the number of triangles.

Item Number: M022261A

The three figures below are divided into small congruent triangles.



Figure 1

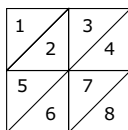


Figure 2

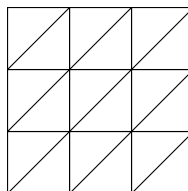


Figure 3

- A. Complete the table below. First, fill in how many small triangles make up Figure 3. Then, find the number of small triangles that would be needed for the 4th figure if the sequence of figures is extended.

Figure	Number of Small Triangles
1	2
2	8
3	
4	

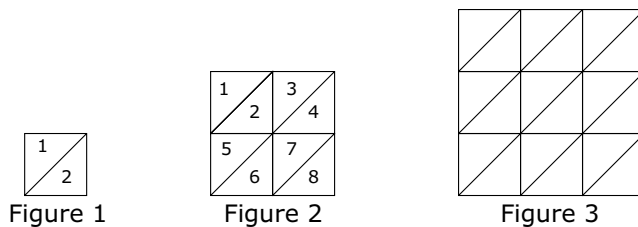
- B. The sequence of figures is extended to the 7th figure. How many small triangles would be needed for Figure 7?

Answer: _____

- C. The sequence of figures is extended to the 50th figure. Explain a way to find the number of small triangles in the 50th figure that does not involve drawing it and counting the number of triangles.

Item Number: M022261B

The three figures below are divided into small congruent triangles.



- A. Complete the table below. First, fill in how many small triangles make up Figure 3. Then, find the number of small triangles that would be needed for the 4th figure if the sequence of figures is extended.

Figure	Number of Small Triangles
1	2
2	8
3	
4	

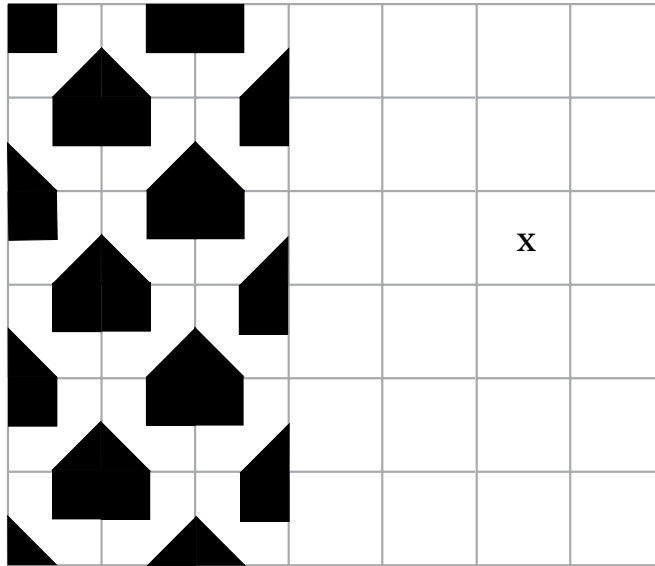
- B. The sequence of figures is extended to the 7th figure. How many small triangles would be needed for Figure 7?

Answer: _____

- C. The sequence of figures is extended to the 50th figure. Explain a way to find the number of small triangles in the 50th figure that does not involve drawing it and counting the number of triangles.

Item Number: M022261C

If the pattern on the grid below was continued, what letter would identify the orientation of the tile in the cell labeled X?



Answer: _____

Item Number: M032744

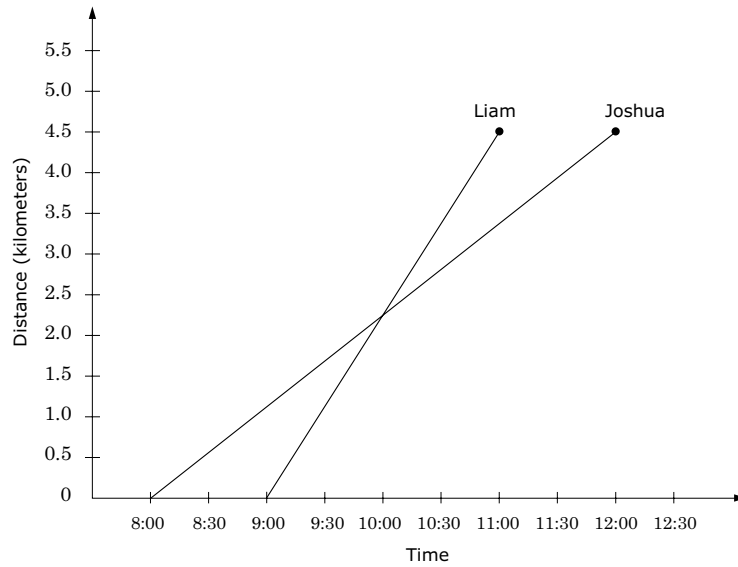
$(3, 6)$, $(6, 15)$, $(8, 21)$

Which of these describes how to get the second number from the first number in every ordered pair above?

- Ⓐ Add 3
- Ⓑ Subtract 3
- Ⓒ Multiply by 2
- Ⓓ Multiply by 2 and then add 3
- Ⓔ Multiply by 3 and then subtract 3

Item Number: M012029

The graph represents the distance and time of a hike taken by Joshua and Liam.



If they both started from the same place and walked in the same direction, at what time did they meet?

- (A) 8:00
- (B) 8:30
- (C) 9:00
- (D) 10:00
- (E) 11:00

Item Number: M012025

The table shows scores for a class on a 10-point test.

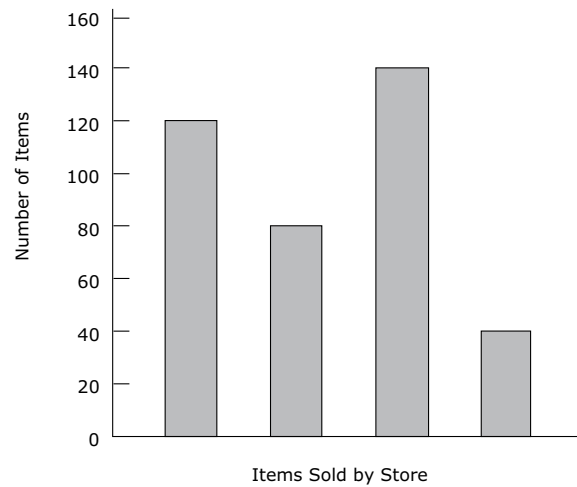
Test Score	Tally	Frequency
4	/	1
5	///	3
6	//// /	6
7	//	2
8	////	4
9	///	3
10	/	1

How many in the class had a score greater than 7?

- (A) 2
- (B) 8
- (C) 10
- (D) 12
- (E) 20

Item Number: M012037

The graph shows the number of pens, pencils, rulers, and erasers sold by a store in one week.



The names of the items are missing from the graph. Pens were the item most often sold, and fewer erasers than any other item were sold. More pencils than rulers were sold. How many pencils were sold?

- (A) 40
- (B) 80
- (C) 120
- (D) 140

Item Number: M022189

Betty talks for less than 2 hours per month. Which plan would be less expensive for her?

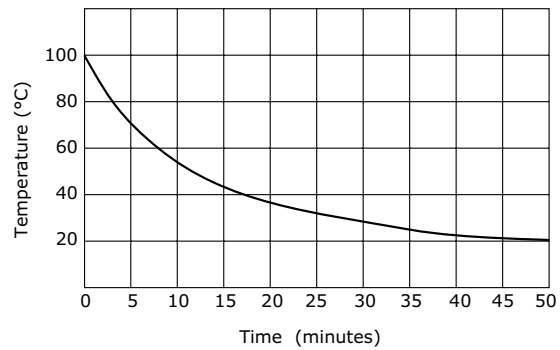
Less expensive plan _____

Explain your answer in terms of both the monthly fee and free minutes.

Item Number: M032762

A beaker of water which has reached boiling point is allowed to cool. The temperature of the water is recorded at five minute intervals, and a temperature-time graph is drawn.

Cooling Curve



About how many minutes did it take for the water to cool the first 20 degrees?

- (A) 3
- (B) 8
- (C) 37
- (D) 50

Item Number: M022135

Frank talks for 5 hours per month at the night rate. What would each plan cost him per month? Show your work.

Cost Per Month for Plan A: _____ zeds

Cost Per Month for Plan B: _____ zeds

Item Number: M032763

Darlene signed up for the *Plan B*, and the cost of one month of service was 75 zeds. How many minutes did she talk that month? Show your work.

Minutes talked _____

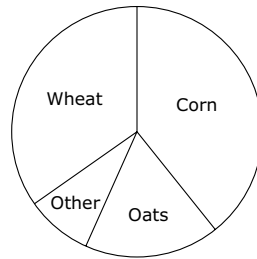
Item Number: M032764

Joe had three test scores of 78, 76, and 74, while Mary had scores of 72, 82, and 74. How did Joe's average (mean) score compare with Mary's average (mean) score?

- (A) Joe's was 1 point higher.
- (B) Joe's was 1 point lower.
- (C) Both averages were the same.
- (D) Joe's was 2 points higher.
- (E) Joe's was 2 points lower.

Item Number: M012006

The graph shows the distribution of crops grown in a certain country.

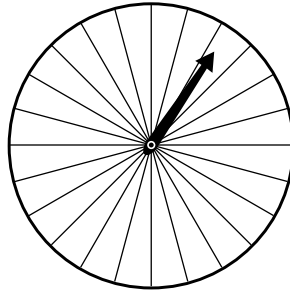


According to the information in the graph, which of these statements is true?

- (A) More oats are grown than wheat.
- (B) Corn is more than one-half of the country's crop.
- (C) Oats are more than one-third of the country's crop.
- (D) The total crop of oats and wheat is greater than the corn crop.

Item Number: M012014

The figure below shows a spinner with 24 sectors. When someone spins the arrow, it is equally likely to stop on any sector.



$\frac{1}{8}$ of the sectors are blue, $\frac{1}{24}$ are purple, $\frac{1}{2}$ are orange, and $\frac{1}{3}$ are red. If a person spins the arrow, on which color sector is the spinner LEAST likely to stop?

- (A) blue
- (B) purple
- (C) orange
- (D) red

Item Number: M022252

In a school there were 1,200 students (boys and girls). A sample of 100 students was selected at random, and 45 boys were found in the sample. Which of these is most likely to be the number of boys in the school?

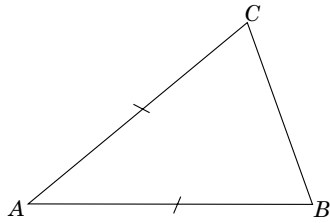
- (A) 450
- (B) 500
- (C) 540
- (D) 600

Item Number: M032271

In an eighth-grade class of 30 students, the probability that a student chosen at random will be less than 13 years old is $\frac{1}{5}$. How many students in the class are less than 13 years old?

- (A) Two
- (B) Three
- (C) Four
- (D) Five
- (E) Six

Item Number: M022146

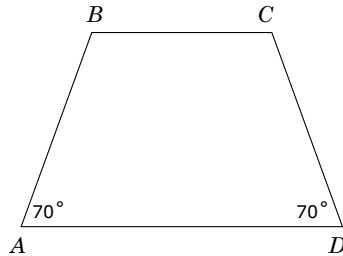


The triangle ABC has $AB = AC$.

Draw a line to divide triangle ABC into two congruent triangles.

Item Number: M032403

$ABCD$ is a trapezoid.



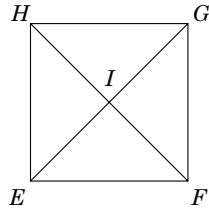
Another trapezoid, $GHIJ$ (not shown), is congruent (the same size and shape) to $ABCD$. Angles G and J each measure 70° . Which of these could be true?

- (A) $GH = AB$
- (B) Angle H is a right angle.
- (C) All sides of $GHIJ$ are the same length.
- (D) The perimeter of $GHIJ$ is 3 times the perimeter of $ABCD$.
- (E) The area of $GHIJ$ is less than the area of $ABCD$.

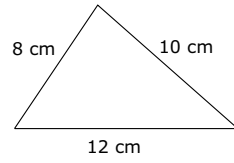
Item Number: M012015

In square $EFGH$, which of these is FALSE?

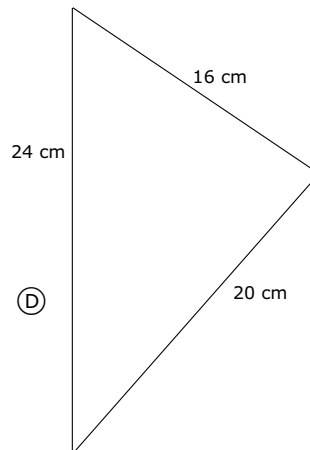
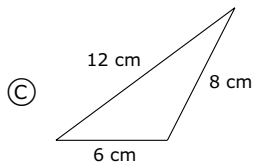
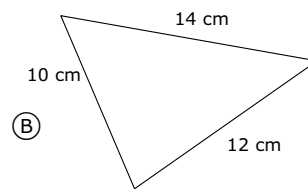
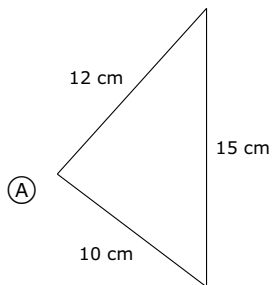
- (A) $\triangle EIF$ and $\triangle EIH$ are congruent.
- (B) $\triangle GHI$ and $\triangle GHF$ are congruent.
- (C) $\triangle EFH$ and $\triangle EGH$ are congruent.
- (D) $\triangle EIF$ and $\triangle GIH$ are congruent.



Item Number: M012005

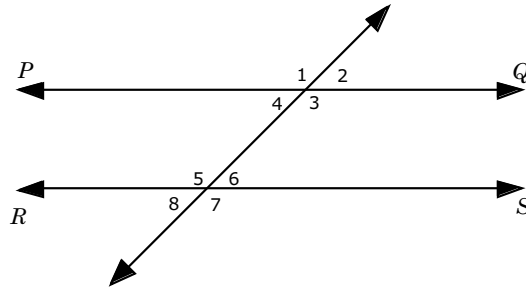


Which of the following triangles is similar to the triangle shown above?



Item Number: M032261

In this figure, PQ and RS are parallel.

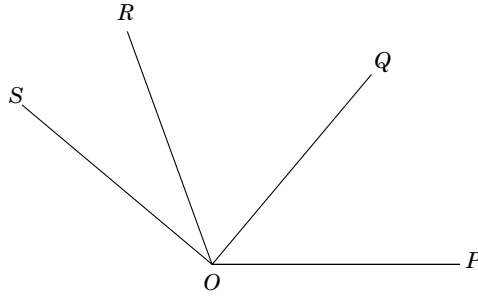


Of the following, which pair of angles has the sum of 180° ?

- (A) $\angle 5$ and $\angle 7$
- (B) $\angle 3$ and $\angle 6$
- (C) $\angle 1$ and $\angle 5$
- (D) $\angle 1$ and $\angle 7$
- (E) $\angle 2$ and $\angle 8$

Item Number: M022142

In the figure, the measure of $\angle POR$ is 110° , the measure of $\angle QOS$ is 90° , and the measure of $\angle POS$ is 140° .

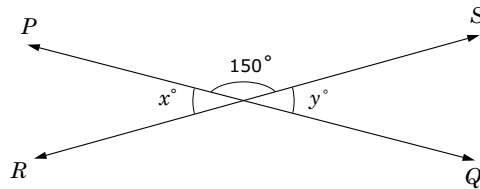


What is the measure of $\angle QOR$?

Answer: _____

Item Number: M022202

In the figure, PQ and RS are intersecting straight lines.



What is the value of $x + y$?

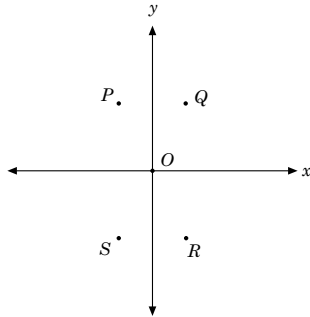
- (A) 15
- (B) 30
- (C) 60
- (D) 180
- (E) 300

Item Number: M012039

A straight line passes through the points (2,3) and (4,7). Which of these points is also on the line?

- Ⓐ (0,2)
- Ⓑ (1,2)
- Ⓒ (2,4)
- Ⓓ (3,5)
- Ⓔ (4,5)

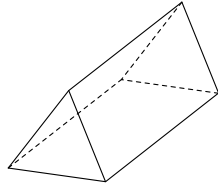
Item Number: M022016



In the coordinate plane above, which point could have coordinates $(2, -4)$?

- (A) P
- (B) Q
- (C) R
- (D) S

Item Number: M032588

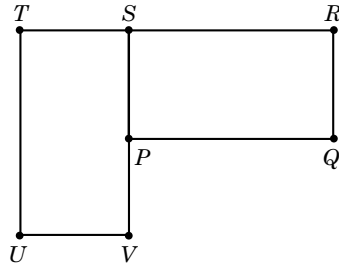


Which of these could be folded to make a shape like the 3-D figure above?

- (A)
- (B)
- (C)
- (D)

Item Number: M032489

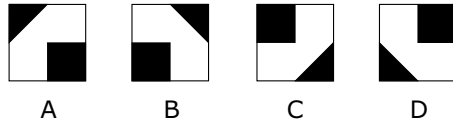
Rectangle $PQRS$ can be rotated (turned) onto rectangle $UVST$.



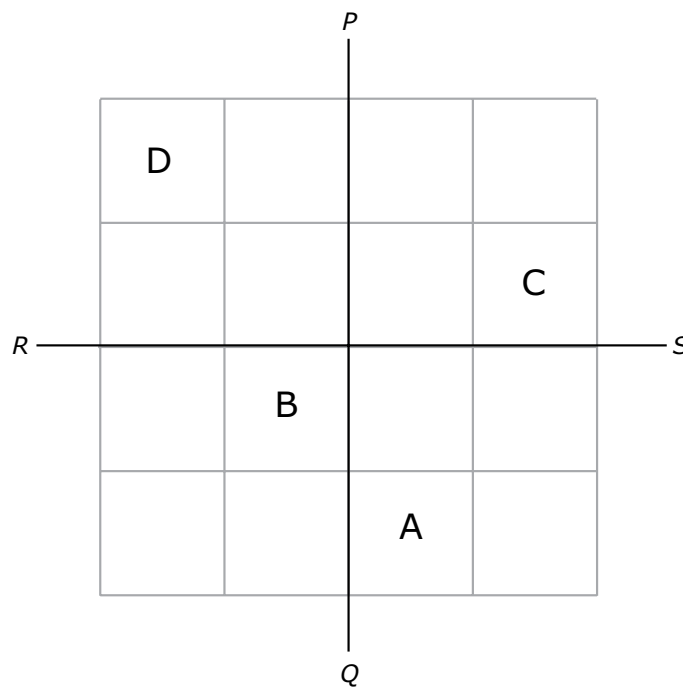
What point is the center of rotation?

- (A) P
- (B) R
- (C) S
- (D) T
- (E) V

Item Number: M022154

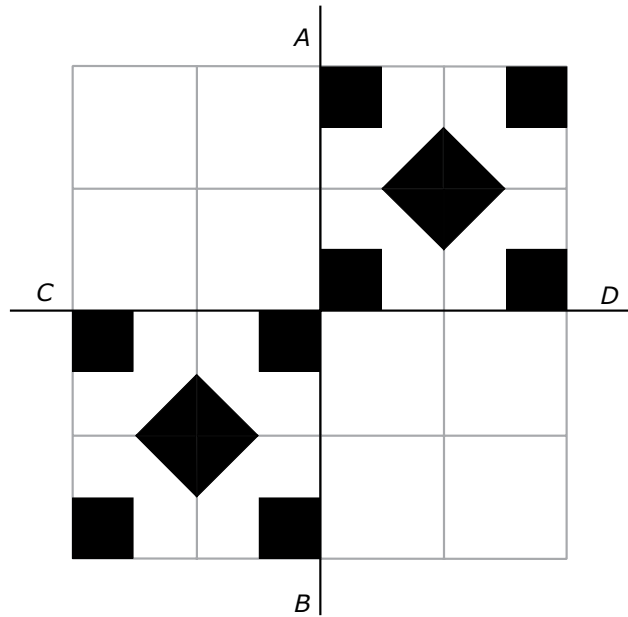


Continue to identify the tiles as shown above. On the grid below, write the letters A, B, C, or D to make a symmetrical pattern where PQ and RS would be lines of symmetry. Arrange the tiles to make a pattern.



Item Number: M032745

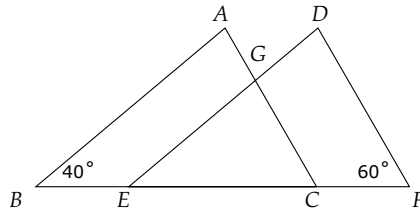
There are several ways of arranging the tiles so that they form patterns. The grid below has been shaded to show how tiles can be placed on some of the squares. The pattern can be continued so that AB and CD are lines of symmetry.



Shade in all the remaining squares on the grid so that the resulting pattern is symmetrical about line AB , and also is symmetrical about line CD .

Item Number: M032743

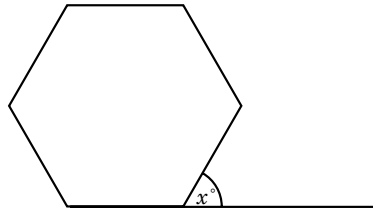
In this figure, triangles ABC and DEF are congruent with $BC = EF$.



What is the measure of angle EGC ?

- (A) 20°
- (B) 40°
- (C) 60°
- (D) 80°
- (E) 100°

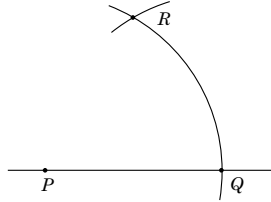
Item Number: M012026



The figure above is a regular hexagon. What is the value of x ?

Answer: _____

Item Number: M032693



In the figure above, an arc of a circle with center P has been drawn to cut the line at Q . Then an arc with the same radius and center Q was drawn to cut the first arc at R . What would be the size of angle PRQ ?

- (A) 30°
- (B) 45°
- (C) 60°
- (D) 75°

Item Number: M032689

The number of 250 milliliter bottles that can be filled from 400 liters of water is

- Ⓐ 16
- Ⓑ 160
- Ⓒ 1,600
- Ⓓ 16,000

Item Number: M022005

Which of these is the LEAST amount of time?

- Ⓐ 1 day
- Ⓑ 20 hours
- Ⓒ 1,800 minutes
- Ⓓ 90,000 seconds

Item Number: M022188

Which of these units would usually be used for an area the size of a soccer field?

- Ⓐ square centimeters
- Ⓑ cubic centimeters
- Ⓒ square meters
- Ⓓ cubic meters

Item Number: M032699

Which of these could be the measure of the area of a triangle?

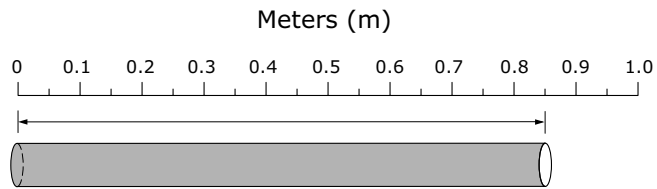
- Ⓐ 2 cm
- Ⓑ 3 m
- Ⓒ 5 cm^2
- Ⓓ 8 m^3

Item Number: M032732

The length of a box is 9 cm to the nearest centimeter. Which of these could be the actual length of the box?

- (A) 10 cm
- (B) 9.9 cm
- (C) 9.6 cm
- (D) 8.6 cm

Item Number: M012003

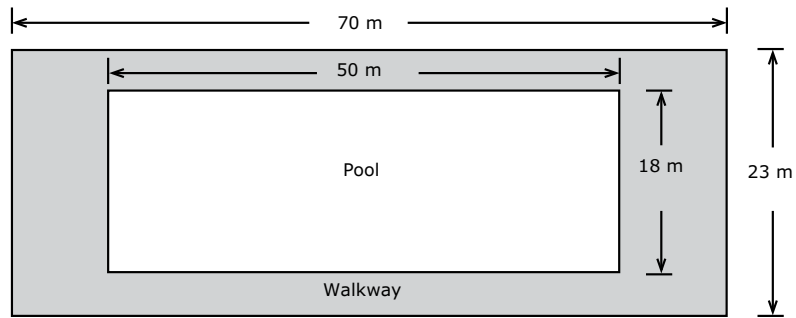


What is the length of the pipe being measured?

- (A) 0.085 m
- (B) 0.805 m
- (C) 0.85 m
- (D) 8.5 m

Item Number: M012038

A rectangular shaped swimming pool has a paved walkway around it as shown.



What is the area of the paved walkway?

- (A) 100 m^2
- (B) 161 m^2
- (C) 710 m^2
- (D) $1,610 \text{ m}^2$

Item Number: M022021

Oranges are packed in boxes. The average diameter of the oranges is 6 cm, and the boxes are 60 cm long, 36 cm wide, and 24 cm deep.

Which of these is the BEST approximation of the number of oranges that can be packed in a box?

- (A) 30
- (B) 240
- (C) 360
- (D) 1,920

Item Number: M032647

A thin wire 20 centimeters long is formed into a rectangle. If the width of this rectangle is 4 centimeters, what is its length?

- (A) 5 centimeters
- (B) 6 centimeters
- (C) 12 centimeters
- (D) 16 centimeters

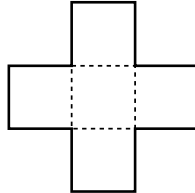
Item Number: M012030

Kris begins her homework at 6:40. If it takes Kris three-quarters of an hour to do her homework, at what time will she finish?

Answer: _____

Item Number: M022148

The figure consists of 5 squares of equal area. The area of the whole figure is 245 cm^2 .



A. Find the area of one square.

Answer: _____ cm^2

B. Find the length of one side of one square.

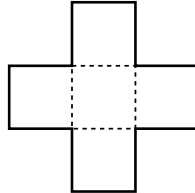
Answer: _____ cm

C. Find the perimeter of the whole figure in centimeters.

Answer: _____ cm

Item Number: M02227A

The figure consists of 5 squares of equal area. The area of the whole figure is 245 cm^2 .



A. Find the area of one square.

Answer: _____ cm^2

B. Find the length of one side of one square.

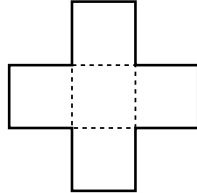
Answer: _____ cm

C. Find the perimeter of the whole figure in centimeters.

Answer: _____ cm

Item Number: M022227B

The figure consists of 5 squares of equal area. The area of the whole figure is 245 cm^2 .



A. Find the area of one square.

Answer: _____ cm^2

B. Find the length of one side of one square.

Answer: _____ cm

C. Find the perimeter of the whole figure in centimeters.

Answer: _____ cm

Item Number: M022227C

In a car rally two checkpoints are 160 km apart. Drivers must travel from one checkpoint to the other in exactly 2.5 hours to earn maximum points.

A. What must the average speed be to travel the 160 km in this time?

Answer: _____

B. A driver took 1 hour to travel through a 40 km hilly section at the beginning of the course.

What must the average speed, in kilometers per hour, be for the remaining 120 km if the total time between checkpoints is to be 2.5 hours?

Answer: _____

Item Number: M032649A

In a car rally two checkpoints are 160 km apart. Drivers must travel from one checkpoint to the other in exactly 2.5 hours to earn maximum points.

A. What must the average speed be to travel the 160 km in this time?

Answer: _____

B. A driver took 1 hour to travel through a 40 km hilly section at the beginning of the course.

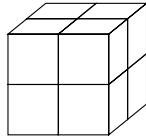
What must the average speed, in kilometers per hour, be for the remaining 120 km if the total time between checkpoints is to be 2.5 hours?

Answer: _____

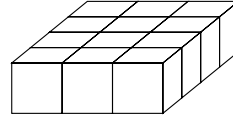
Item Number: M032649B

All the small blocks are the same size. Which stack of blocks has a different volume from the others?

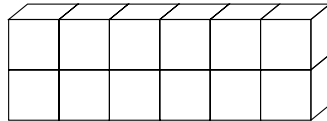
(A)



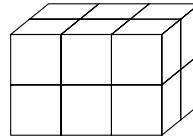
(B)



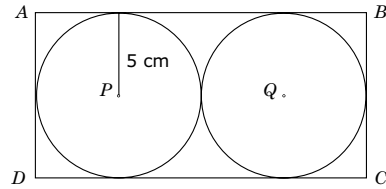
(C)



(D)



Item Number: M012013



In the figure above, $ABCD$ is a rectangle, and circles P and Q each have a radius of 5 cm. What is the area of the rectangle?

- (A) 50 cm^2
- (B) 60 cm^2
- (C) 100 cm^2
- (D) 200 cm^2

Item Number: M032678

In which of these pairs of numbers is 2.25 larger than the first number but smaller than the second number?

Ⓐ 1 and 2

Ⓑ 2 and $\frac{5}{2}$

Ⓒ $\frac{5}{2}$ and $\frac{11}{4}$

Ⓓ $\frac{11}{4}$ and 3

Item Number: M012016

A scoop holds $\frac{1}{5}$ kg of flour. How many scoops of flour are needed to fill a bag with 6 kg of flour?

Answer: _____

Item Number: M022156

$$\frac{3}{5} + \left(\frac{3}{10} \times \frac{4}{15} \right) =$$

(A) $\frac{3}{51}$

(B) $\frac{1}{6}$

(C) $\frac{6}{25}$

(D) $\frac{11}{25}$

(E) $\frac{17}{25}$

Item Number: M022199

Two-thirds of the people present at the beginning of a meeting are men. Nobody leaves but 10 more men and 10 more women arrive at the meeting. Which of the following statements is true?

- (A) There would then be more men than women at the meeting.
- (B) There would then be the same number of men as there are women at the meeting.
- (C) There would then be more women than men at the meeting.
- (D) From the information given, you cannot tell whether there would be more women or men.

Item Number: M022191

What fraction of an hour has passed between 1:10 a.m. and 1:30 a.m.?

(A) $\frac{1}{5}$

(B) $\frac{1}{3}$

(C) $\frac{1}{2}$

(D) $\frac{2}{3}$

(E) $\frac{3}{4}$

Item Number: M012027

In a group of children, 16 have birthdays during the first half of the year, and 14 have birthdays during the second half of the year. What fraction of the group have birthdays during the first half of the year?

(A) $\frac{14}{30}$

(B) $\frac{14}{16}$

(C) $\frac{16}{14}$

(D) $\frac{16}{30}$

(E) $\frac{30}{16}$

Item Number: M012041

A teacher and a doctor each have 45 books. If $\frac{4}{5}$ of the teacher's books and $\frac{2}{3}$ of the doctor's books are novels, how many more novels does the teacher have than the doctor?

- (A) 2
- (B) 3
- (C) 6
- (D) 30
- (E) 36

Item Number: M022004

Alice ran a race in 49.86 seconds. Betty ran the same race in 52.30 seconds.
How much longer did it take Betty to run the race than Alice?

- Ⓐ 2.44 seconds
- Ⓑ 2.54 seconds
- Ⓒ 3.56 seconds
- Ⓓ 3.76 seconds

Item Number: M022010

A car has a fuel tank that holds 45 L of fuel. The car consumes 8.5 L of fuel for each 100 km driven. A trip of 350 km was started with a full tank of fuel. How much remained in the tank at the end of the trip?

- Ⓐ 15.25 L
- Ⓑ 16.25 L
- Ⓒ 24.75 L
- Ⓓ 29.75 L

Item Number: M022127

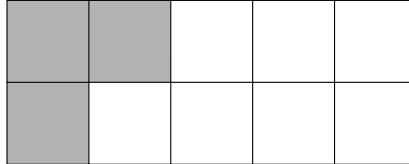
John and Cathy were told to divide a number by 100. By mistake John multiplied the number by 100 and obtained an answer of 450. Cathy correctly divided the number by 100. What was her answer?

- (A) 0.0045
- (B) 0.045
- (C) 0.45
- (D) 4.5

Item Number: M032079

In the figure, how many MORE small squares need to be shaded so that $\frac{4}{5}$ of the small squares are shaded?

- (A) 5
- (B) 4
- (C) 3
- (D) 2
- (E) 1



Item Number: M012001

Write a fraction that is less than $\frac{4}{9}$.

Answer: _____

Item Number: M022012

Which of the following is 78.2437 rounded to the nearest hundredth?

- (A) 100
- (B) 80
- (C) 78.2
- (D) 78.24
- (E) 78.244

Item Number: M022144

In which list are the numbers ordered from greatest to least?

- (A) 0.233, 0.3, 0.32, 0.332
- (B) 0.3, 0.32, 0.332, 0.233
- (C) 0.32, 0.233, 0.332, 0.3
- (D) 0.332, 0.32, 0.3, 0.233

Item Number: M022198

Use the patterns in the previous table to answer the following questions.

- A. Pat made a shape with a **total** of 64 tiles. How many were black and how many were red?

Answer: _____ black tiles _____ red tiles

- B. Pat made a shape that used 49 **black** tiles.
How many **red** tiles did Pat use in that shape?

Answer: _____ red tiles

- C. Next, Pat made a shape using 44 of the **red** tiles. How many black tiles would Pat need to complete the black part of the shape?

Answer: _____ black tiles

Item Number: M032670

What is the value of $1 - 5 \times (-2)$?

- Ⓐ 11
- Ⓑ 8
- Ⓒ -8
- Ⓓ -9

Item Number: M032612

If n is a negative integer, which of these is the largest number?

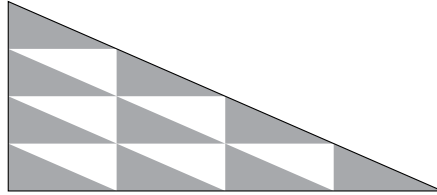
- (A) $3 + n$
- (B) $3 \times n$
- (C) $3 - n$
- (D) $3 \div n$

Item Number: M032643

When a new highway is built, the average time it takes a bus to travel from one town to another is reduced from 25 minutes to 20 minutes. What is the percent decrease in time taken to travel between the two towns?

- Ⓐ 4%
- Ⓑ 5%
- Ⓒ 20%
- Ⓓ 25%

Item Number: M022139



In the figure above, each of the smaller triangles has the same area. What is the ratio of the shaded area to the unshaded area?

- (A) 5:3
- (B) 8:5
- (C) 5:8
- (D) 3:5

Item Number: M032447

A computer club had 40 members, and 60% of the members were girls.
Later, 10 boys joined the club. What percent of the members now are girls?
Show the calculations that led to your answer.

Answer: _____

Item Number: M032233

Alice can run 4 laps around a track in the same time that Carol can run 3 laps. When Carol has run 12 laps, how many laps has Alice run?

- Ⓐ 9
- Ⓑ 11
- Ⓒ 13
- Ⓓ 16

Item Number: M012004

A shop increased its prices by 20%. What is the new price of an item which previously sold for 800 zeds?

- Ⓐ 640 zeds
- Ⓑ 900 zeds
- Ⓒ 960 zeds
- Ⓓ 1,000 zeds

Item Number: M032228

A machine uses 2.4 liters of gasoline for every 30 hours of operation.
How many liters of gasoline will the machine use in 100 hours?

- Ⓐ 7.2
- Ⓑ 8.0
- Ⓒ 8.4
- Ⓓ 9.6

Item Number: M032533

Three brothers, Bob, Dan, and Mark, receive a gift of 45,000 zeds from their father. The money is shared between the brothers in proportion to the number of children each one has. Bob has 2 children, Dan has 3 children, and Mark has 4 children.

How many zeds does Mark get?

- Ⓐ 5,000
- Ⓑ 10,000
- Ⓒ 15,000
- Ⓓ 20,000

Item Number: M032727

At a play, $\frac{3}{25}$ of the people in the audience were children.

What percent of the audience was this?

- (A) 12%
- (B) 3%
- (C) 0.3%
- (D) 0.12%

Item Number: M032570

Which of these is closest to $11^2 + 9^2$?

- Ⓐ $20 + 20$
- Ⓑ $20 + 80$
- Ⓒ $120 + 20$
- Ⓓ $120 + 80$

Item Number: M032609

Which of these is equal to $370 \times 998 + 370 \times 2$?

- (A) $370 \times 1,000$
- (B) 372×998
- (C) 740×998
- (D) $370 \times 998 \times 2$

Item Number: M032690

9	1	4	5
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The four digits above are to be arranged from largest to smallest to form a four-digit number. The same four digits are then to be arranged from smallest to largest to form another four-digit number. What is the difference between the two resulting four-digit numbers?

- (A) 3,726
- (B) 4,726
- (C) 8,082
- (D) 8,182
- (E) 8,192

Item Number: M012028

About 7,000 copies of a magazine are sold each week. Approximately how many magazines are sold each year?

- (A) 8,400
- (B) 35,000
- (C) 84,000
- (D) 350,000
- (E) 3,500,000

Item Number: M022194

The teachers at Parkway School plan to send 6 newsletters per year to each of the 620 families with children at the school. The newsletters each need 2 sheets of paper. The paper is sold in packs of 500 sheets.

What is the least number of packs of paper needed to print the school newsletter for the year?

Answer: _____

Item Number: M032652

A garden has 14 rows. Each row has 20 plants. The gardener then plants 6 more rows with 20 plants in each row.

How many plants are now there altogether?

Answer: _____

Item Number: M032671

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