GENIUS CEREBRUM
THE INTELLECTUALS

# GC INTERNATIONAL MATHEMATICS OLYMPIAD - LEVEL THREE SAMPLE PAPER

## Question 1

Mandy bought 6 books about plants and 10 books about fish. She also bought 7 science magazines.
Each book cost $ 661 and each magazine cost $ 181. How much did Mandy spend in all?

## Key: 11843

## Solution

**Step 1:** Find the total number of books.

6 + 10 = 16

**Step 2:** Find the cost of the books.

$ 661 × 16 = $ 10,576

**Step 3:** Find the cost of the magazines.

$ 181 × 7 = $ 1,267

**Step 4:** Find the total cost.

$1,267 + $ 10,576 = $ 11,843

Mandy spent $ 11,843.

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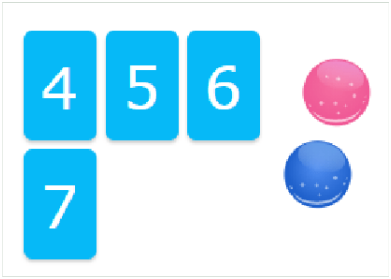
## Question 2

You pick a card and pick a marble. How many outcomes are possible?




A. 8 B. 16 C. 20 D. 3

## Key: A

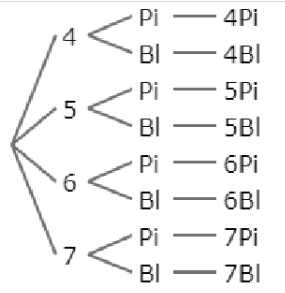
## Solution

Make a tree diagram, then count the branches.

The first event has 4 outcomes: 4, 5, 6 and 7.

The second event has 2 outcomes: pink (Pi) and blue (Bl).

Make a tree diagram:




Count the number of branches. There are 8 branches, so there are 8 possible outcomes.

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# Question 3

Neha was in charge of keeping attendance for a local summer camp each year.

Summer camp attendance

| Year | Kids |
|---|---|
| 2016 | 79 |
| 2017 | 81 |
| 2018 | 79 |
| 2019 | 87 |
| 2020 | 87 |

According to the table, what was the rate of change in kids/year between 2016 and 2020?

A. 2 kids B. 3 Kids/year C. 18 kids/year D. 12 kids/year

## Key: A

## Solution

Plug the numbers into the formula for rate of change and simplify.

$$\text{Rate of change} = \frac{\text{change in value}}{\text{change in time}}$$

$$= \frac{87 \text{ kids} - 79 \text{ kids}}{2020 - 2016}$$

$$= \frac{87 \text{ kids} - 79 \text{ kids}}{4 \text{ years}}$$

$$= \frac{8 \text{ kids}}{4 \text{ years}}$$

$$= 2 \text{ kids per year}$$

The rate of change between 2016 and 2020 was 2 kids per year.

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# Question 4

Select the expressions from the options that are equivalent to $2^{-5} * 8^{-5} =$

1. $1/16^5$ 2. $16^{-5}$ 3. $1/16^{-5}$ 4. $16^{-10}$

A. 1 & 3 B. 2 & 3 C. 1 & 2 D. None of the above

# Key: C

# Solution

**Step 1: Write $2^{-5} \cdot 8^{-5}$ in the form $16^{\square}$.**

$2^{-5} \cdot 8^{-5}$

$= (2 \cdot 8)^{-5}$ *Use the identity* $a^x b^x = (ab)^x$

$= 16^{-5}$

So, $2^{-5} \cdot 8^{-5}$ is equal to $16^{-5}$.

So that is directly option 2.

Now, use identity, $a^{-x} = 1/a^x$

So, $16^{-5} = 1/16^5$.

So both option 1 & 2 are correct.

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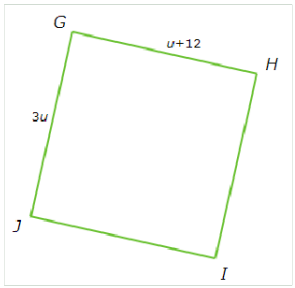
# Question 5

Quadrilateral GHIJ is a square. What is the value of u?



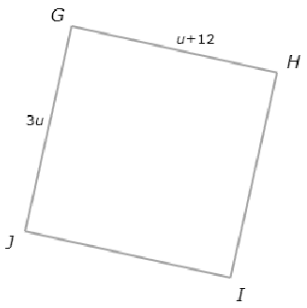

The value of u is?

A. 5 B. 6 C. 7 8. 9

## Key: B

## Solution

Since *GHIJ* is a square, $\overline{GH} \cong \overline{GJ}$.




Set *GH* equal to *GJ* and solve for *u*.

| | |
|---|---|
| $GH = GJ$ | |
| $u + 12 = 3u$ | *Plug in* GH = u + 12 *and* GJ = 3u |
| $12 = 2u$ | *Subtract* u *from both sides* |
| $6 = u$ | *Divide both sides by* 2 |

So, $u = 6$.

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# Question 6

In Edward's grade, 1/2 of the students have a sister. Of the students who have a sister, 1/2 also have a brother. What fraction of the students in Edward's grade have both a sister and a brother?

A. ½ B. 1/8 C. ¼ D. 1/16

## Key: C

## Solution

In Edward's grade, 1/2 of 1/2 of the students have both a sister and a brother.

$$\frac{1}{2} \times \frac{1}{2} = ?$$

Multiply the numerators and multiply the denominators.

$$\frac{1}{2} \times \frac{1}{2} = \frac{1 \times 1}{2 \times 2} = \frac{1}{4}$$

Of the students in Edward's grade, 1/4 have both a sister and a brother.

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# Question 7

(15 + 85) + 4 = n + (85 + 4), find the value of n?

## Key: 15

## Solution

To find n, use properties of addition to make both sides of the equation look the same.

The associative property says you can group the addends with brackets and get the same sum.

$(15 + 85) + 4 = n + (85 + 4)$

$15 + (85 + 4) = n + (85 + 4)$ Apply the associative property

Now match up the two sides of the equation.

$15 + (85 + 4) = n + (85 + 4)$

So, n = 15.

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# Question 8

Solve for s.

$10^s = 100{,}000$

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

## Key: C

## Solution

An **exponent** tells you how many times its **base** is used as a factor.

When 10 is raised to a whole number exponent, its value has a leftmost digit of 1 and all other digits are 0. The exponent tells you how many 0s come after the 1.

| Exponent | Power of 10 | Value | Number of 0s |
|---|---|---|---|
| 1 | $10^1 = 10$ | 10 | 1 |
| 2 | $10^2 = 10 \cdot 10$ | 100 | 2 |
| 3 | $10^3 = 10 \cdot 10 \cdot 10$ | 1,000 | 3 |
| 4 | $10^4 = 10 \cdot 10 \cdot 10 \cdot 10$ | 10,000 | 4 |

To solve for $s$, look at the right side of the equation and count the number of 0s after 1.

$10^s = 100{,}000$

There are 5 of them.

So, $s = 5$.

$10^5 = 100{,}000$

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# Question 9

Raj has $ 100 in a savings account that earns him 10% interest annually. The interest is not compounded. How much will he have in total in 5 years ?

A. $ 125 B. $ 175 C. $ 150 D. 200

## Key: C

## Solution

Write the rate as a decimal.

10% = 0.1

Calculate the interest earned.

i = prt
= $100 · 0.1 · 5
= $50

Find the total amount by adding the interest to the principal.

$50 + $100 = ₹150

The total amount will be $ 150.

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# Question 10

Every few years, George's entire family gets together for a family reunion. This year, George's parents are hosting, and they have to cook a lot of food to feed the crowd. George has volunteered to do the most tedious job: shelling peas. There is a proportional relationship between the amount of time (in minutes) George spends shelling peas, x, and the weight (in kilograms) of the peas he has shelled, y.

After 5 minutes, George has shelled 1 kilogram of peas. Write the equation for the relationship between x and y.

Y = ?

A. 0.5 x B. 0.6 x C. 0.2 x D. 0.7 x

## Key: C

## Solution

There is a proportional relationship between the amount of time (in minutes) George spends shelling peas, x, and the weight (in kilograms) of the peas he has shelled, y. To write the equation for this relationship, find k.

Use the numbers given in the problem and their units.

After 5 minutes, George has shelled 1 kilogram of peas.

When the x-value is 5, the y-value is 1. Now calculate k, the ratio of y to x.

K = y/x

= 1/5

= 0.2

Plug k = 0.2 into the equation y = kx to find the equation for this relationship.

y=0.2x

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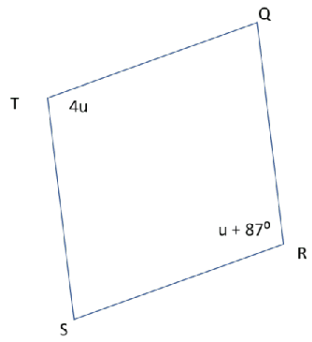
# Question 11

Find the value of 'u' in the rhombus QRST.




A. $32^{o}$ B. $29^{o}$ C. $36^{o}$ D. $27^{o}$

# Key: B

# Solution

First, find the two angles whose measures are in terms of u. The measure of ∠R is u+87° and the measure of ∠T is 4u. Notice that ∠R and ∠T are opposite angles.

Opposite angles in a rhombus are congruent, so set ∠R equal to ∠T and solve for u.

∠R = ∠T

u+87°= 4u Plug in ∠R=u+87° and ∠T=4u

87° = 3u Subtract u from both sides

29° = u Divide both sides by 3

So, u=29°.

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# Question 12

What is the percent of change from 7,000 to 70?

A. 109% increase B. 99% decrease C. 99% increase D. 109% increase

## Key: B

## Solution

$$\text{percent of change} = \frac{\text{amount of change}}{\text{original amount}}$$
$$= \frac{7{,}000 - 70}{7{,}000}$$
$$= \frac{6{,}930}{7{,}000}$$
$$= 0.99$$

Write the number as a percent.

0.99 → 99%

Finally, figure out whether the percent of change is an increase or decrease. Since the number goes down from 7,000 to 70, it is a decrease.

The percent of change is a 99% decrease.

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# Question 13

Rishi purchased 1 kilogram of split washers and 1 kilogram of standard washers. What was the total cost?

| | |
|---|---|
| split washers | ₹50.06 per kg |
| bolts | ₹98.08 per kg |
| standard washers | ₹48.94 per kg |
| nails | ₹62.17 per kg |
| screws | ₹62.38 per kg |
| rivets | ₹110.64 per kg |

## Key: 99

## Solution

Find the cost of the split washers. Multiply:

₹50.06 × 1 = ₹50.06

Find the cost of the standard washers. Multiply:

₹48.94 × 1 = ₹48.94

Now find the total cost by adding:

₹50.06 + ₹48.94 = ₹99

The total cost was ₹99.

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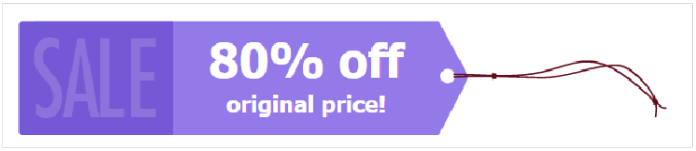
# Question 14

Rizwan wants to buy a bag of walnuts. The original price is $5.40. How much will Rizwan pay if he buys it during the sale? Pls refer the offer tag here.




A. $2.40 B. $1.96 C. $1.08 D. $2.56

## Key: C

## Solution

The discount is 80% of the original price. Multiply to find 80% of $5.40.

discount

= 80% of 5.40

= (80/ 100) * 5.40 Write the percent as a fraction

= 0.85.40 Write the fraction as a decimal

= 4.32 Simplify

The discount is $4.32. This means the sale price will be ₹4.32 less than the original price.

Find the sale price.

Subtract the discount from the original price.

sale price

= 5.40–4.32

= 1.08 Simplify

Rizwan will pay $1.08.

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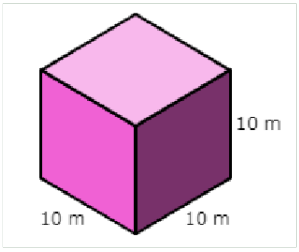
# Question 15

What is the surface area of the following figure?




A. 600 sq.m B. 1000 sq.m C. 100 sq.m D. 30 sq.m

## Key: A

## Solution

Find the area of one face:

Area = side × side

= 10 × 10

= 100

The area of each face is 100 square metres. There are 6 faces. Multiply:

Surface area = 6 × 100

= 600

The surface area of the cube is 600 square metres.

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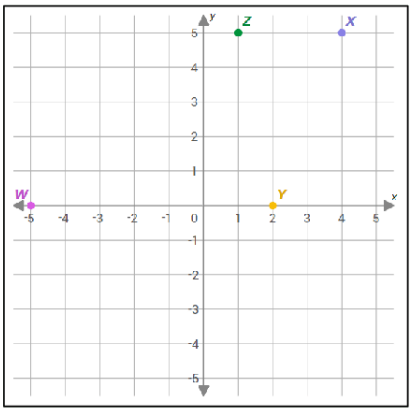
# Question 16

What are the coordinates of point Y?

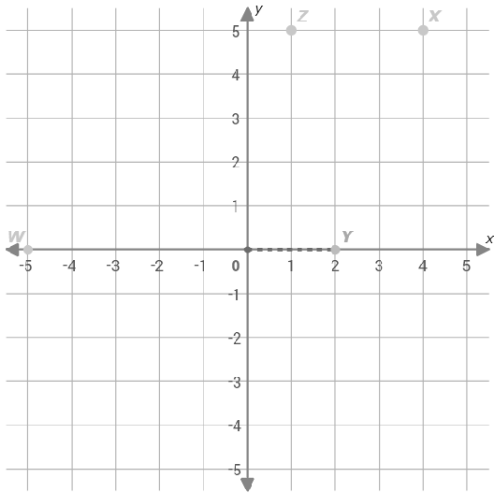



A. (0,2) B. (0,1) C. (5,1) D. (2,0)

## Key: D

## Solution

Point $Y$ is on the $x$-axis. Move left until you reach the $y$-axis.




This position on the $y$-axis is **0**.

So, the $y$-coordinate of point $Y$ is **0**.

This position on the $x$-axis is **2** units to the right of the origin. All $x$-coordinates to the right of the origin are **positive**.

So, the $x$-coordinate of point $Y$ is **2**.

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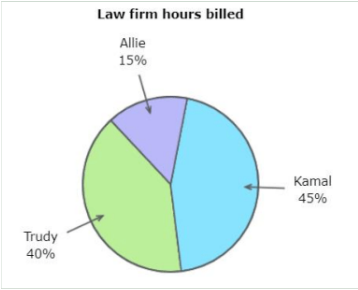
## Question 17

A law firm in Springfield kept track of how many hours were billed by each partner last year.



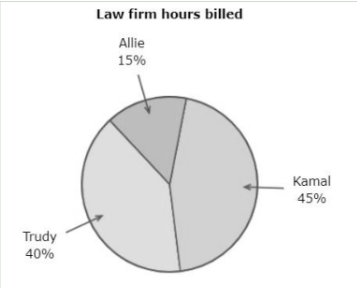

Which list is arranged from the partner with the lowest billings to the partner with the highest billings?

A. Trudy, Allie, Kamal  B. Allie, Kamal, Trudy  C. Trudy, Kamal, Allie  D. Allie, Trudy, Kamal

## Key: D

## Solution

A law firm in Springfield kept track of how many hours were billed by each partner last year.




Look at the label for each section of the graph. Write the labels in order from the partner with the lowest billings to the partner with the highest billings.

15% < 40% < 45%

Allie, Trudy, Kamal

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# Question 18

Darnell's family is going to install a custom swing set in the back garden. There are 5 kinds of swings and 3 kinds of slides, and the swing set has room for one of each. How many different swing sets can Darnell's family buy?

## Key: 15

## Solution

5 kinds of swings and 3 kinds of slides are available.

So its, 5 x 3 = 15 . So 15 different kinds of can be bought.

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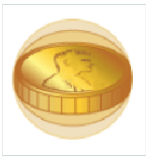
# Question 19

You flip a coin.



What is Probability (tails or heads)?

A. 1/3 B. ½ C. 1 D. ¼

## Key: C

## Solution

Mutually exclusive events can never occur at the same time. If A and B are mutually exclusive, then:

P(A or B) = P(A) + P(B)

The events **tails** and **heads** are mutually exclusive. It's impossible for a coin flip to be both at the same time.

Find P(tails). Flipping a coin has two possibilities: heads or tails.

$$P(\text{tails}) = \frac{1}{2}$$

Find P(heads).

$$P(\text{heads}) = \frac{1}{2}$$

Find P(tails or heads).

P(tails or heads) = P(tails) + P(heads)

$$= \frac{1}{2} + \frac{1}{2}$$

$$= \frac{2}{2}$$

Write your answer in simplest form.

$$\frac{2}{2} = 1$$

P(tails or heads) = 1

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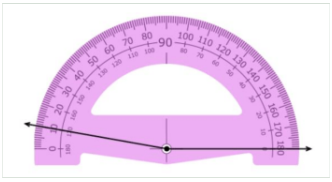
# Question 20

What is the measurement of this angle?



A. 10° B. 180° C. 160° D. 170°

## Key: D

## Solution

One ray is lined up with 0° on the inside ring, which is the same as 180° on the outside ring. Read the angle measurement on the *inner* ring where the other ray crosses the protractor.

This angle measures 170°.

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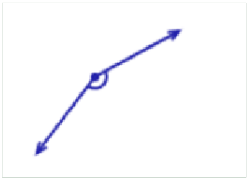
# Question 21

Is this angle greater than, equal to, or less than a right angle?



A. Greater than right angle B. Equal to right angle

C. less than a right angle D. None

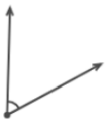
## Key: A

## Solution

A right angle looks like the corner of a square.

right angle

greater than a right angle



less than a right angle

Look at this angle:

This angle is greater than a right angle.

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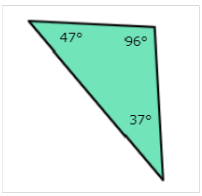
# Question 22

What kind of triangle is this?




A. acute B. obtuse C. right D. none

## Key: B

## Solution

In an acute triangle, all three angles are less than 90°.
In a right triangle, one angle is exactly 90°.
In an obtuse triangle, one angle is greater than 90°.

This triangle is an obtuse triangle. The 96° angle is greater than 90°.

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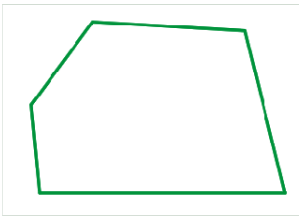
# Question 23

Is this polygon a trapezium?



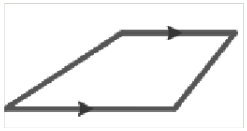
A. Yes B. No

## Key: B

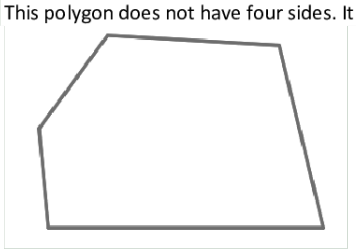
## Solution

A trapezium is a quadrilateral with one pair of parallel sides. A quadrilateral is a four-sided polygon.

In diagrams, we mark parallel sides with matching arrows.



To see if a polygon is a trapezium, first check that it is a quadrilateral.
This polygon does not have four sides. It is not a quadrilateral.



So, this polygon is not a trapezium.

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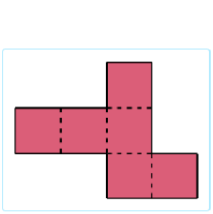
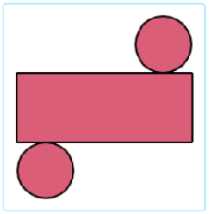
# Question 24

Which net will make this figure?





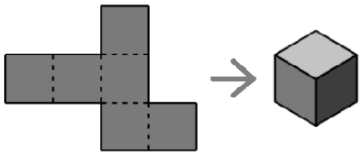
A B

## Key: B

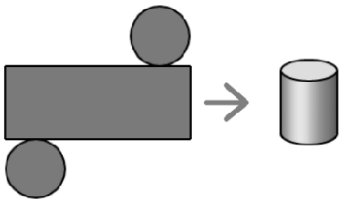
## Solution

Imagine folding these nets.

Fold this net along the dotted lines. This net makes a cube. This is not the correct net.



Fold this net so that two edges of the rectangle each wrap around a circle. This net makes a cylinder. This is the correct net.



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# Question 25

Which sign makes the statement true?

$-3.75 \; ? \; -3\frac{1}{2}$

| > | < | = |
|---|---|---|
| A | B | C |

## Key: B

## Solution

Compare the whole-number parts.

$-3.75 \; ? \; -3\frac{1}{2}$

The whole-number parts are the same, so next compare the decimal and fraction parts.

Write the mixed number as a decimal.

$-3.75 \; ? \; -3\frac{1}{2}$

$\downarrow$

$-3.75 \; ? \; -3.5$

Write the numbers with the same number of decimal places.

$-3.75 \; ? \; -3.5$

$\downarrow$

$-3.75 \; ? \; -3.50$

Remember that when comparing negative numbers, larger numbers like 3.75 (if you ignore the minus sign) are *less* than smaller numbers like 3.50. So:

$-3.75 < -3\frac{1}{2}$

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# Question 26

A triangle has sides with lengths of 7 centimetres, 7 centimetres, and 9 centimetres. Is it a right triangle?

A. Yes B. No

## Key: B

## Solution

If $a^2 + b^2 = c^2$, then the triangle is a right triangle. This is called the converse of Pythagoras' theorem.

Plug in 7, 7, and 9. Use the smaller numbers for $a$ and $b$ and the largest number for $c$.

$$a^2 + b^2 \stackrel{?}{=} c^2$$
$$7^2 + 7^2 \stackrel{?}{=} 9^2$$
$$49 + 49 \stackrel{?}{=} 81$$
$$98 \neq 81$$

The result is false. So, it is not a right triangle.

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# Question 27

Which of the following expression describes the sequence below. Use $n$ to represent the position of a term in the sequence, where $n = 1$ for the first term.

-9, -8, -7, -6, ...

A. n+10 B. n(n+10) C. n-10 D. $n^{-10}$

## Key: C

## Solution

The sequence -9, -8, -7, -6, ... looks like 1, 2, 3, 4, ... except each term is 10 smaller. So, the formula is $\boldsymbol{n - 10}$. Check the first four terms:

To find the 1st term, plug in $n = 1$.

$n - 10 = 1 - 10 = -9$

To find the 2nd term, plug in $n = 2$.

$n - 10 = 2 - 10 = -8$

To find the 3rd term, plug in $n = 3$.

$n - 10 = 3 - 10 = -7$

To find the 4th term, plug in $n = 4$.

$n - 10 = 4 - 10 = -6$

The sequence -9, -8, -7, -6, ... is described by the expression $n - 10$.

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## Question 28

$0.1 \div 0.5 - 0.2 = ?$

## Key: 0

## Solution

First, identify the operations in the expression.

$0.1 \div 0.5 - 0.2$

This expression has division and subtraction. The order of operations says to divide before subtracting.

$0.1 \div 0.5 - 0.2$

$= 0.2 - 0.2$

Now, subtract.

$0.2 - 0.2$

$= 0$

The value of the expression is 0.

---

## Question 29

A lollipop factory used 416.78 kilograms of sugar to make 8 batches of lollipops. How much sugar did the factory put in each batch?

Answer up to 4 decimal places

## Key: 52.0975

## Solution

Divide the total sugar used 416.78 kilograms by 8 batches of lollipos.

= 416.78/8

Add zeroes after the decimal point in the number you are dividing. Divide until there is no remainder.

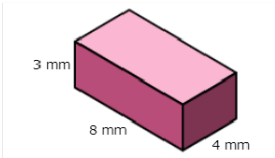
```
    52.0975
8 416.7800
– 40
    16
  – 16
     0 7
    – 0
      78
    – 72
       60
     – 56
        40
      – 40
         0
```

The factory put 52.0975 kilograms of sugar in each batch of lollipops.

---

## Question 30

Look at this rectangular prism:




If the height is tripled, then which of the following statements about its volume will be true?

A. The new volume will be ½ times the old volume

B. The new volume will be 4 times the old volume

C. The new volume will be 2 times the old volume

D. The new volume will be 3 times the old volume

## Key: D

## Solution

You can solve this problem without using the measurements given in the diagram.

The original rectangular prism had this volume:

$V = lwh$

The new rectangular prism will have 3 times the height. Since the original height was $h$, the new height will be $3h$. Calculate the volume:

$V = lw(3h)$
$= 3lwh$

Divide the new volume by the original volume and simplify.

$$\frac{\text{new volume}}{\text{original volume}} = \frac{3lwh}{lwh}$$
$$= 3$$

The new volume will be 3 times the old volume.

---

## Question 31

This equation shows how the number of pictures Regan has taken so far this year is related to the number of days she spends on holiday.

$p = d + 11$
The variable $d$ represents the number of days she spends on holiday, and the variable $p$ represents the total number of pictures taken this year. How many days will Regan have to spend on holiday before she will have taken 13 pictures?

A. 1 B. 2 C. 3 D. 4

## Key: B

## Solution

Regan has taken 13 pictures. Plug in p = 13.

P = d + 11

13 = d + 11 Plug in p = 13

2 = d Subtract 11 from both sides

Regan will have to spend 2 days on holiday before she will have taken 13 pictures.

---

## Question 32

_____% of 65 = 39

A. 50% B. 55% C. 60% D. 65%

## Key: C

## Solution

A percent is 1 part out of 100.

1% is equal to $\frac{1}{100}$ or 0.01.

Proportions can be used to solve percent problems.

$$\frac{\text{part}}{\text{whole}} = \frac{\text{percent}}{100}$$

The part is 39.

The whole is 65.

Let $n$ represent the percent.

Write a proportion to solve for $n$.

$$\frac{39}{65} = \frac{n}{100}$$

$$39 \cdot 100 = 65n$$

$$3{,}900 = 65n$$

$$3{,}900 \div 65 = 65n \div 65$$

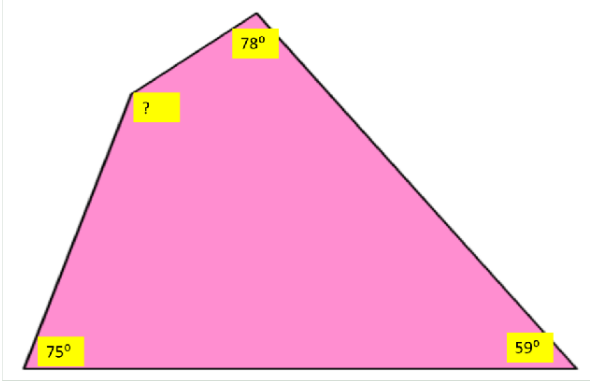
$$60 = n$$

**60%** of 65 = 39

---

# Question 33

What is the measure of the missing angle?




A. 152° B. 78° C. 90° D. 148°

## Key: D

## Solution

The sum of the angles in a quadrilateral is always 360°.

The sum of the four angles must be 360°. The three angles you know measure 78°, 75° and 59°.

Write an equation and find the measure of the unknown angle.

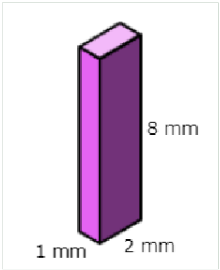
$78° + 75° + 59° + ? = 360°$
$212° + ? = 360°$
$? = 360° - 212°$
$? = 148°$

The measure of the missing angle is 148°.

---

# Question 34

What is the volume in $mm^3$ ?




## Key: 16

## Solution

Volume of a rectangular prism:

Volume = length × width × height

Find the length, width, and height of the rectangular prism.

length: 1 mm

width: 2 mm

height: 8 mm

Use these numbers in the formula.

Volume = length × width × height
= 1 × 2 × 8
= 16

The volume is 16 cubic millimetres.

---

# Question 35

Cooper surveyed some students at his school about their favourite colours. Of the students surveyed, 3 said red was their favourite colour, while 3 of the students had other favourite colours. If Cooper surveys 8 more students, how many of them should he expect to pick red, based on past data?

A. 1 B. 2 C. 3 D. 4

## Key: D

## Solution

First write the experimental probability as a fraction in simplest form.

$$\begin{aligned} P(\text{red}) &= \frac{\text{red}}{\text{total}} \\ &= \frac{\text{red}}{\text{red + other}} \\ &= \frac{3}{3+3} \\ &= \frac{3}{6} \\ &= \frac{1}{2} \end{aligned}$$

The experimental probability is $\frac{1}{2}$.

We can predict the outcome of the second set of trials by assuming that the ratio will be the same as in the first set of trials. Write a proportion by setting the two ratios equal to each other, then solve.

$$\begin{aligned} 1/2 &= n/8 \\ 1/2(2 \cdot 8) &= n/8(2 \cdot 8) && \textit{Multiply both sides by } (2 \cdot 8) \\ 1 \times 8 &= 2n && \textit{Simplify} \\ 8 &= 2n && \textit{Simplify} \\ 4 &= n && \textit{Divide both sides by 2} \end{aligned}$$

If Cooper surveys 8 more students, he should expect 4 of them to pick red.

---

# Question 36

Yesterday the children at Stanley's preschool chose to pursue various activities.

| | |
|---|---|
| play house | 1 |
| do puzzles | 5 |
| play dress-up | 1 |
| play a maths game | 3 |

Based on past data, if 16 pre-schoolers are at school today, how many should you expect to do puzzles?

A. 5 B. 3 C. 8 D. 1

## Key: C

## Solution

First write the experimental probability as a fraction in simplest form.

$$\text{P(do puzzles)} = \frac{\text{do puzzles}}{\text{total}}$$
$$= \frac{5}{1+5+1+3}$$
$$= \frac{5}{10}$$
$$= \frac{1}{2}$$

The experimental probability is $\frac{1}{2}$.

We can predict the outcome of the second set of trials by assuming that the ratio will be the same as in the first set of trials. Write a proportion by setting the two ratios equal to each other, then solve.

$$1/2 = n/16$$
$$1/2(2 \cdot 16) = n/16(2 \cdot 16) \quad \textit{Multiply both sides by } (2 \cdot 16)$$
$$1 \times 16 = 2n \quad \textit{Simplify}$$
$$16 = 2n \quad \textit{Simplify}$$
$$8 = n \quad \textit{Divide both sides by 2}$$

You should expect 8 of the preschoolers to do puzzles today.

---

## Question 37

Which number below is the same as $-\frac{2}{3}-(-(\frac{3}{5}))$.

A. $\frac{4}{15}$ B. $-\frac{4}{15}$ C. $-\frac{1}{2}$ D. $-\frac{19}{15}$

## Key: D

## Solution

$$-\frac{2}{3}-(-(-\frac{3}{5})) = -\frac{2}{3}+(-\frac{3}{5})$$
$$= -\frac{2}{3}-\frac{3}{5}$$
$$= -\frac{10}{15}-\frac{9}{15}$$
$$= -\frac{19}{15}$$

---

## Question 38

$\sqrt[3]{(2\sqrt{16})}$ = ?

A. 4 B. 6 C. 8 D. 2

## Key: D

## Solution

$\sqrt[3]{(2\sqrt{16})} = \sqrt[3]{2 * 4} = \sqrt[3]{8} = 2$

---

## Question 39

If x= 4, find value of $x^{-3/2}(x^{100}/x^{99})$

A. ¼ B. 1/8 C. 1/16 D. ½

## Key: D

## Solution

$x^{-3/2}(x^{100}/x^{99})$ $= x^{-32} * x$

$= x^{-3/2+1}$

$= x^{-1/2}$

$= 4^{-1/2}$

$= \frac{1}{\sqrt{4}}$

$= \frac{1}{2}$

---

## Question 40

|2x - 1| = 5

Which values of x which make this equation true?

A. -3, 2 B. 3, 2 C. 3, -2 D. -3,-2

## Key: C

## Solution

If |2x - 1| = 5, then 2x - 1 = 5 or 2x - 1 = -5

Therefore x = 3 or x = -2

---

## Question 41

Find the value of X for the following equation.

8(x + 1) + 3(2x - 2) = 44

A. 1 B. 2 C. 3 D. 4

## Key: C

## Solution

8(x + 1) + 3(2x - 2) = 44

8x + 8 + 6x - 6 = 44

8x + 6x + 8 - 6 = 44

14x + 2 = 44

14x = 42

$x = \frac{42}{14}$

x = 3

---

## Question 42

The sum of three integers is 66. The second is 2 more than the first, and the third is 4 more than twice the first. What are the integers?

A. 12,14,40 B. 15,17,34 C. 16,18,32 D. 17,19,30

## Key: B

## Solution

Let x be the first number.

Then the second number is x + 2 and the third number is 2x + 4.

x + (x + 2) + (2x + 4) = 66

4x + 6 = 66

4x = 60

x = 15

x + 2 = 17

2x + 4 = 34

The three numbers are 15, 17, and 34

---

## Question 43

A dress originally cost $120. If it is now on sale for $100, what is the percent of the decrease in price?

A. $11\frac{1}{3}$ B. $15\frac{5}{16}$ C. $16\frac{2}{3}$ D. $12\frac{1}{3}$

## Key: C

## Solution

Amount of decrease = 120 - 100 = $20

x/ 100 = 20 /120

x /100 = 1/ 6

6x = 100

x = 100/6

= $16\frac{2}{3}$

% of decrease in price is $16\frac{2}{3}$ %

---

## Question 44

Let x = 3 and y = 2, find the value of the expression.

y ( xy - 7 ) /10 = ?

A. -1/5 B. 1/5 C. -2/5 D. 2/5

## Key: A

## Solution

y ( xy - 7 ) /10 = ?

replace with x = 3 and y = -2

Answer is -1/5

---

## Question 45

If you add 6 years to Johnny's age, then divide by 3, you find his brothers age.

His brother is 12. How old is Johnny?

A. 20 B. 26 C. 30 D. 32

## Key: C

## Solution

J = Johnny's age

B = brother's age

(J + 6) /3 = B

(J + 6) /3 = 12

J + 6 = 36

J = 30

J = 30 Johnny is 30 years old

---

# Question 46

Johnny drove at 32 miles per hour for 30 minutes and at 48 miles per hour for 45 minutes. How far did he travel?

A. 46 miles B. 58 miles C. 52 miles D. 60 miles

## Key: C

## Solution

Let d1 = the distance travelled for the first 30 minutes and

d2 = the distance travelled for the next 45 minutes.

30 mins = ½ hr, 45 mins = ¾ hr.

From the rate equation d = rt,

d1 = 32 mi/hr • ½ hr = 16 mi

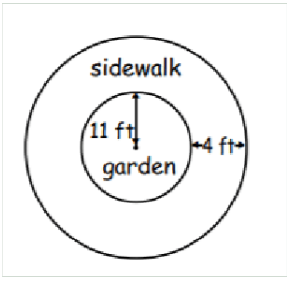
d2 = 48 mi.hr• ¾ hr = 36mi

The total distance travelled is d1+ d2 = 16mi + 36mi = 52mi

---

# Question 47

This diagram shows a sidewalk around a circular garden. What is the area of the sidewalk?




A. 104π ft2 B. 114π ft2 C. 106 πft2 D. 108 πft2

## Key: A

## Solution

$A_{sidewalk} = A_{outer\ circle} - A_{inner\ circle}$

$A_{sidewalk} = \pi \bullet (15ft)^2 - \pi \bullet (11ft)^2$

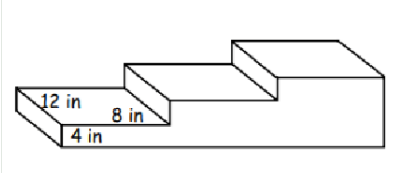
$= 225\pi ft^2 - 121\pi ft^2$

$= 104\pi ft2$

---

# Question 48

Each step is 4 inches high, 8 inches deep and 12 inches wide. What is the volume of the entire figure ?




A. 2504 $in^3$ B. 2618 $in^3$ C. 2304 $in^3$ D. 2816 $in^3$

## Key: C

## Solution

$V = (4 \bullet 8 \bullet 12) + (8 \bullet 8 \bullet 12) + (12 \bullet 8 \bullet 12)$

$= (4 + 8 + 12)\, 8 \bullet 12$

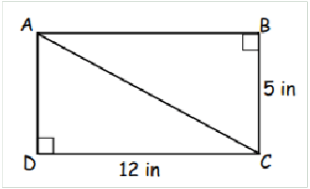
$= 24 \bullet 8 \bullet 12$

$= 2{,}304\ in^3$

---

# Question 49

Figure out the length of the diagonal AC.




A. 13 in B. 14 in C. 15 in D. 16 in

## Key: A

## Solution

Δ ABC is a right angled triangle

$AC^2 = 12^2 + 5^2$

$AC^2 = 144 + 25$

$AC^2 = 169$

$AC = \sqrt{169}$

AC = 13 in

---

# Question 50

Victoria cut 10 pink roses and 20 white roses from the bushes in her back garden. If she wants to make some identical flower arrangements with no flowers left over, what is the greatest number of arrangements Victoria can make?

A. 5 B. 10 C. 15 D. 20

## Key: B

## Solution

The highest common factor is the largest whole number that is a factor of each of two or more numbers.

Write the prime factorisation for each number.

$10 = 2 \times 5$
$20 = 2 \times 2 \times 5$

Next, find the common factors shared by both of the numbers.

$10 = 2 \times 5$
$20 = 2 \times 2 \times 5$

Finally, multiply the common factors to find the highest common factor.

$2 \times 5 = 10$

The highest common factor of 10 and 20 is **10**. That means that the greatest possible number of arrangements is 10, because 10 pink roses could be used to make 10 arrangements with 1 pink rose each and 20 white roses could be used to make 10 arrangements with 2 white roses each.

The greatest number of arrangements Victoria can make is 10.

---

# Question 51

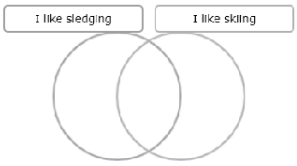
Of the students in Dan's class, 7 like sledging. 8 students like skiing. 4 students like both sledging and skiing. How many students like skiing but not sledging?

A. 1 B. 2 C. 3 D. 4

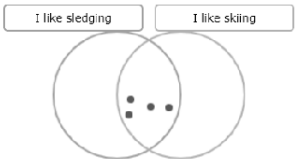
## Key: D

## Solution

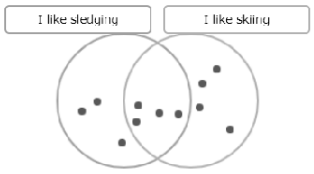
Make a Venn diagram to solve the problem.




4 students like both sledging and skiing. Put 4 dots in the area that is in both circles.




Now add dots to the other two areas until there are 7 dots in the "**I like sledging**" circle and 8 dots in the "**I like skiing**" circle.




Count the dots that are in the "**I like skiing**" circle but are not in the "**I like sledging**" circle. There are 4 dots.

4 students like skiing but not sledging.

---

## Question 52

Kenny and his brother are going to a hockey game on Saturday. The game starts at 3:30 P.M. It takes 30 minutes to drive to the hockey rink, and they want to get there 45 minutes before the game starts to get good seats. What is the latest time Kenny and his friends can leave for the game?

A. 1:15 PM B. 2:30 PM C. 2:15 PM D. 1:45 PM

## Key: C

## Solution

Add the times to find the total elapsed time.

30 min + 45 min = 75 min = 1 h 15 min

Now find 1 hour and 15 minutes before 3:30 P.M.

Count back by hours to find 1 hour before 3:30 P.M. This is 2:30 P.M.

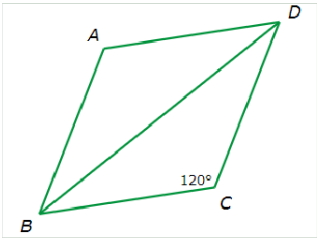
Now subtract 15 minutes from 2:30 P.M. This is 2:15 P.M.

Kenny and his should leave at 2:15 P.M.

---

# Question 53

Quadrilateral ABCD is a rhombus. What is ∠BDC?

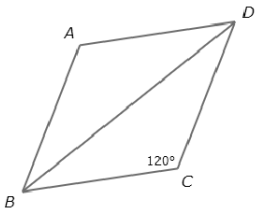



A. 45° B. 60° C. 30° D. 90°

## Key: C

## Solution

Since *ABCD* is a rhombus, ∠*ADC* and ∠*BCD* are supplementary.




Set the sum of their measures equal to 180° and plug in ∠*BCD* to solve for ∠*ADC*.

$\angle ADC + \angle BCD = 180°$

$\angle ADC + 120° = 180°$ *Plug in* ∠BCD = 120°

$\angle ADC = 60°$ *Subtract* 120° *from both sides*

Also, $\overline{BD}$ bisects ∠*ADC*, so $\angle BDC = \angle ADB = \frac{1}{2} \cdot \angle ADC$. Next, plug in ∠*ADC* = 60° to this equation and solve for ∠*BDC*.

$\angle BDC = \frac{1}{2} \cdot \angle ADC$

$= \frac{1}{2}(60°)$ *Plug in* ∠ADC = 60°

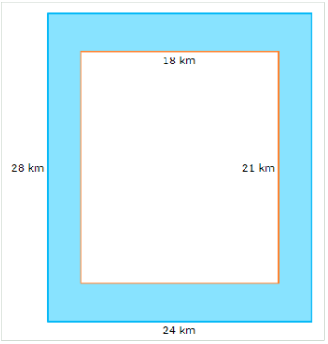
$= 30°$ *Multiply*

So, ∠*BDC* = 30°.

---

# Question 54

What is the area of the shaded region?



## Key: 294

## Solution

To find the area of the shaded region, subtract the area of the inner shape from the area of the outer shape. Start by finding the area of the inner shape.

Find the base and height of the inner rectangle.

base: 18 km

height: 21 km

Use these numbers in the formula.

$\text{inner area} = \text{base} \cdot \text{height}$

$= 18 \cdot 21$

$= 378$

Now find the units. The lengths are measured in kilometres, so the area is measured in square kilometres.

The area of the inner rectangle is 378 square kilometres.

Next, find the area of the outer shape.

Find the base and height of the outer rectangle.

base: 24 km

height: 28 km

Use these numbers in the formula.

$\text{outer area} = \text{base} \cdot \text{height}$

$= 24 \cdot 28$

$= 672$

As with the inner rectangle, the lengths of the outer rectangle are measured in kilometres. So, the area is measured in square kilometres.

The area of the outer rectangle is 672 square kilometres.

Finally, subtract the inner area from the outer area to find the area of the shaded region.

$\text{shaded area} = 672 - 378$

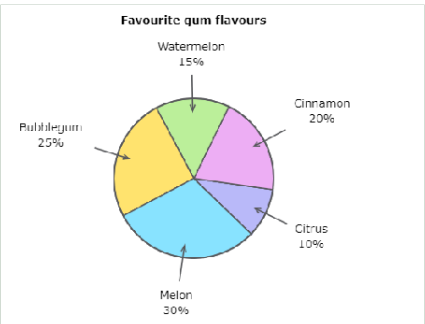
$= 294$

The area of the shaded region is 294 square kilometres.

---

## Question 55

People living in Lowell were questioned about their favourite gum flavours.




What is the measure of the central angle in the "Citrus" section?

A. $32^0$ B. $36^0$ C. $48^0$ D. $60^0$

## Key: B

## Solution

According to the graph, 10% of people chose "Citrus".

Find 10% of 360°.

$10\% \text{ of } 360° = 0.10 \times 360°$
$= 36°$

In the "Citrus" section, the measure of the central angle is 36°.

---

# Question 56

__X__ < $\sqrt[3]{14}$ <__Y___

A. x= 3, y= 2 B. x=2, y= 3 C. x = -2, y= -2 D. None

## Key: B

## Solution

Find the perfect cubes that are just below and just above 14.

The perfect cube just below 14 is 8.

$\sqrt[3]{8} = 2$

The perfect cube just above 14 is 27.

$\sqrt[3]{27} = 3$

$\sqrt[3]{8} < \sqrt[3]{14} < \sqrt[3]{27}$, so $2 < \sqrt[3]{14} < 3$.

---

# Question 57

$2c^7 . 3c . 2c^6$

A. $12C^{13}$ B. $6C^{14}$ C. $12C^{14}$ D. $12C^{12}$

## Key: C

## Solution

Simplify.

$2c^7 \cdot 3c \cdot 2c^6$

$2 \cdot 2 \cdot 3(c^7c \cdot c^6)$ *Group the coefficients and group the variables*

$12(c^7c \cdot c^6)$ *Multiply the coefficients*

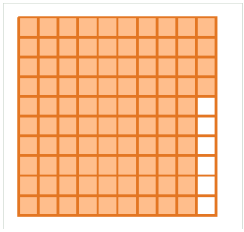
$12c^{7+1+6}$ *Multiply, remembering to add the exponents*

$12c^{14}$

---

# Question 58

What percentage of the shape is orange?



## Key: 94

## Solution

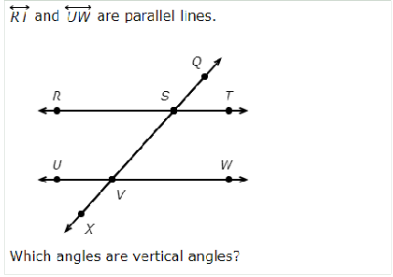
This shape has 100 sections. 94 of the sections are orange.

Write 94 out of 100 as a percentage: 94%

---

# Question 59

$\overleftrightarrow{RT}$ and $\overleftrightarrow{UW}$ are parallel lines.



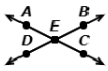

Which angles are vertical angles?

A. RSQ & RSV B. RSQ & UVS C. RSQ & WVX D. RSQ & TSV

## Key: D

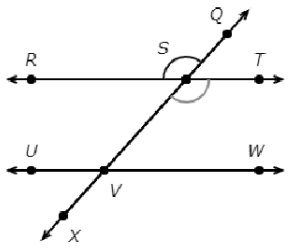
## Solution

Two angles are **vertical angles** if they are formed by intersecting lines and are not adjacent.




$\angle AEB$ and $\angle DEC$ are vertical angles.

$\angle RSQ$ and $\angle TSV$ are vertical angles.
They are formed by the intersecting lines $\overleftrightarrow{QX}$ and $\overleftrightarrow{RT}$ and they are not adjacent.

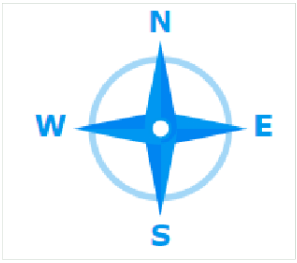



Other options do not meet this criteria.

---

## Question 60

Janelle leaves work to run some errands. She goes 1 block south, 4 blocks west, and 1 block north.
Which direction must Janelle go to get back to her workplace?

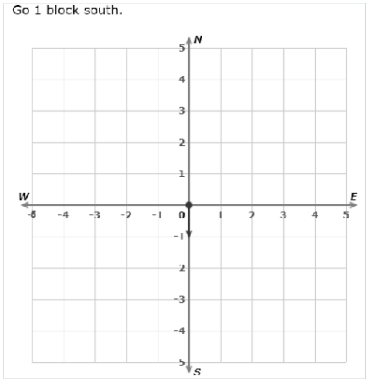



A. North B. South C. West D. East

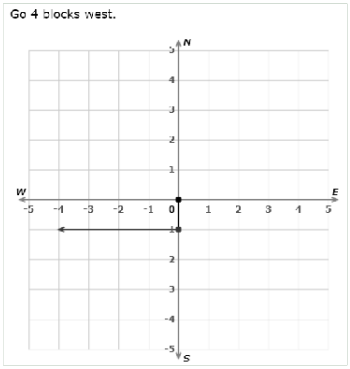
## Key: D

## Solution

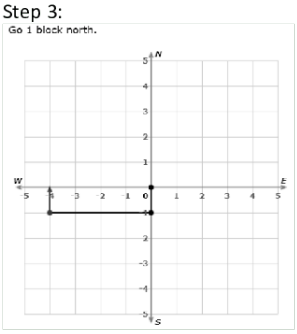
Step 1:




Step 2:




Step 3:




Step 4: