



Preparation for the National Grade Six Assessment

Guide #2 | Mathematics Multiple Choice

Who are you?

If you are in grade 5 or 6 and will be taking the next National Grade Six Assessment, then this packet is for you. This packet has past exam questions which have been solved with explanations to help you learn how to solve similar questions. Completing this packet will increase your chances of passing the exam with the highest possible score.

Who are we?

This packet was created by the Caribbean Education Project, a team of students and teachers from universities in the United States and the Caribbean. Our goal is to help you with your preparations for the next exam and to help you better understand each topic. We want you to achieve your best score on the exam. If you are not clear on concepts after reading the material, ask your parent or guardian for help. If they cannot help, ask another family member or a friend. If no one can help you, then ask your parents to send us a message on Facebook or WhatsApp or e-mail us.

- To reach us through Facebook, go on Facebook and search for “Shawn Shivdat.” Then send me a message using Facebook Messenger.
- To reach us by WhatsApp, save this number “Shawn Shivdat, +1 404-406-9638” and message me on WhatsApp.
- To reach us by e-mail, send a message to this e-mail address: info@caribed.org.

Keep in contact

If you are using this packet to prepare, we would like to hear from you. Please keep in touch with us so we can help you with any questions you may have. We can also provide updates when future materials are posted. Send us your name and contact information through WhatsApp, Facebook Messenger, or e-mail (listed above), or send a picture of this sheet filled out through WhatsApp, Facebook Messenger, or e-mail.

Name: _____

Parent’s phone number: _____

Parent’s e-mail address: _____

**PLEASE SHARE THIS GUIDE WITH OTHERS WHO MAY BENEFIT
FROM USING IT.**



How to use this guide:

1. The following pages have a total of 40 past exam questions. Try to answer these questions in the prescribed 70 minutes. If you are not able to answer a question, skip it and go on to the next question. When you are done answering all the questions, you can return to the ones you are having trouble with during your remaining time.
2. It is okay if you were not able to answer all the questions correctly on your first try. Keep practicing the questions, and you will get better. Soon, you will be able to answer all the questions in the 70 minutes. (**TIP:** Practice makes you perfect, so keep practicing.)
3. Answers to all the questions are on the pages immediately after the practice test. When you finish answering the questions, compare your answers to the answers on these pages.
4. Mark the questions which you got wrong.
5. Read our guide to solving each question. Even for questions you got correct, read the explanations we provided because you will likely learn something from them. Our explanations provide valuable information which can provide you with additional tricks to solve other problems.
6. Always read the instructions for each question carefully before attempting to answer. Also, read the question itself carefully and pay attention to what the question is asking you to do before attempting to answer it.
7. We provide the answers to all the questions in the practice exams to help you. Do not look at the answers before you attempt the questions. If you look at the answers before, you will not learn a lot from this packet. So, do we have a deal? Okay, I heard you say yes.





MINISTRY OF EDUCATION
NATIONAL GRADE SIX ASSESSMENT
PRACTICE TEST
MATHEMATICS
PAPER 1
2013

Hey students, for the purposes of practice, you can ignore the instructions listed below about shading circles on an answer sheet. We have included that here so you will be familiar with these instructions on exam day.

1 hour and 10 minutes

READ THESE INSTRUCTIONS CAREFULLY BEFORE YOU ATTEMPT TO ANSWER THE QUESTIONS.

1. WRITE YOUR CANDIDATE NUMBER ON THE ANSWER SHEET AND UNDERLINE THE SUBJECT.
2. This test has **40** questions. You are required to answer **ALL** questions. Four responses are given for each question. The responses are **A, B, C** and **D**. Only **ONE** response is correct.
3. If you are not sure of the answer to a question, then choose the one which you think is **BEST**. On your answer sheet, shade the letter you have chosen.
4. **BE SURE THAT THE QUESTION NUMBER IN THE BOOKLET IS THE SAME AS THE ONE YOU HAVE USED ON YOUR ANSWER SHEET.**

Here is an example done for you.

1. The sum of 4 and 5 is

- | | | | |
|-----|-----|-----|-----|
| (A) | 1. | (B) | 9. |
| (B) | 20. | (D) | 45. |

ANSWER SHEET

1. A B C D

Note: the letter **B** is shaded on the answer sheet because **9**, the correct answer, is next to **B**.

5. If you make a mistake, erase the shaded letter cleanly, then shade the letter next to the answer you have now chosen.
6. **REMEMBER**, each answer **MUST** only be shown by the shading on your **Answer Sheet**.
7. Remember only **ONE** answer must be provided for each question.

DO NOT TURN OVER THIS PAGE UNTIL YOU ARE TOLD TO DO SO.



- Which is an **even** number?
(A) 76 818 (B) 83 059
(C) 88 967 (D) 99 701
- What is the value of **6** in 25 673?
(A) 60 (B) 600
(C) 6000 (D) 60 000
- Which shows the operation of division?
(A) Includes 6 more objects (B) Decrease 15 by 6
(C) Make 6 greater by 15 (D) Share 15 among 6
- The sum of 10 and 407 is
(A) 470 (B) 417
(C) 397 (D) 307

Study **Figure 1**, then answer **questions 5 and 6**.

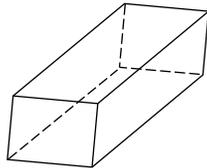


Figure 1

- The figure is called a
(A) cube. (B) cylinder.
(C) cuboid. (D) sphere.
- The figure has _____ sides.
(A) 4 (B) 5
(C) 6 (D) 8



7. A cricketer who scores one run less than a century has made _____ runs.

- (A) 19 (B) 99
(C) 101 (D) 111

8. The unit used to measure the mass of heavy objects is

- (A) degree (B) kilogramme
(C) kilometre (D) litre

9. Which is the symbol for 'not a member of'?

- (A) \in (B) \notin
(C) \cap (D) $\{\}$

10. Which pair are equal sets?

- (A) $\{3, 7, 10, 8\}$ $\{6, 17, 13\}$
(B) $\{6, 10, 12, 5\}$ $\{60, 6, 10, 5\}$
(C) $\{3, 6, 8, 7\}$ $\{7, 3, 8, 6\}$
(D) $\{6, 0, 10, 7\}$ $\{5, 7, 0, 6\}$

11. Which fraction represents 1%?

- (A) $\frac{1}{10}$ (B) $\frac{1}{100}$
(C) $\frac{1}{1000}$ (D) $\frac{1}{10000}$



Figure 2 shows the favourite fruits of children in Grade Six. Study it, then answer questions 12 and 13.

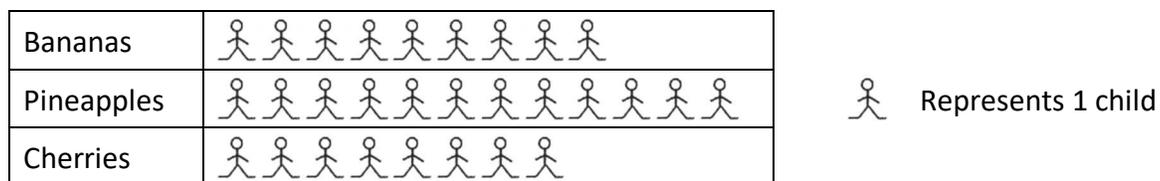
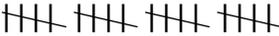
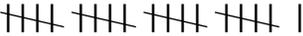
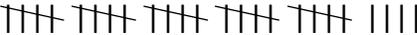


Figure 2

12. The graph in **Figure 2** is called a
- (A) bar graph. (B) line graph.
(C) pictograph. (D) pie chart.
13. Which tally marks represent the number of children who like **pineapples and cherries**?
- (A)  (B) 
(C)  (D) 
14. The number that comes before 7010 is
- (A) 7000 (B) 7009
(C) 7011 (D) 7090
15. The expanded form for 9074 is
- (A) $90 + 700 + 4$ (B) $900 + 70 + 4$
(C) $9000 + 7 + 4$ (D) $9000 + 70 + 4$
16. $1.900 - 0.149 =$
- (A) 0.751 (B) 1.751
(C) 1.851 (D) 1.811



17. $60.5 \div 100 =$

- (A) 60 500 (B) 6050
(C) 6.05 (D) 0.605

18. What is the **LCM** for 12, 18, and 24?

- (A) 6 (B) 24
(C) 54 (D) 72

Study **Figure 3**, then answer **question 19**.

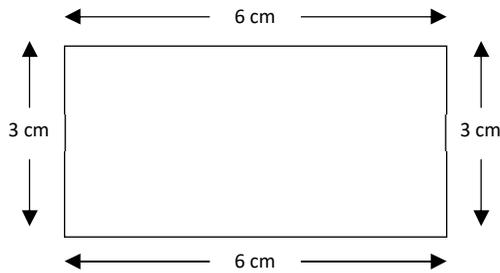


Figure 3

19. How many lines of symmetry can be drawn in **Figure 3** above?

- (A) 2 (B) 4
(C) 6 (D) 8



29. The average of six numbers is 14. If the total for **five** of the number is 70, what is the sixth number?
- (A) 12 (B) 14
(C) 35 (D) 70
30. What is the next number in the sequence 1, 4, 9, 16, 25?
- (A) 33 (B) 34
(C) 35 (D) 36
31. The **largest** number is
- (A) 8.893 (B) 8.889
(C) 8.763 (D) 8.762
32. **9, 12, and 15** is to **3** as **15, 20, and 25** is to
- (A) 2 (B) 5
(C) 7 (D) 10

Study **Figure 6**, then answer **question 33**.



Figure 6

33. The value of **y** is
- (A) 20° (B) 117°
(C) 120° (D) 243°
34. When Lalita poured 3 litres of water into an empty upright cylindrical metal drum, 1 cm of the bottom was covered. If the drum is 1 m high, what is the capacity of the drum in litres?
- (A) 3 (B) 10
(C) 30 (D) 300



35. Fazil began doing his homework assignments at 17:05 h and finished at 19:35 h. The number of minutes Fazil took to complete his homework assignments was
- (A) 150 (B) 120
(C) 90 (D) 65

Study the **Venn Diagram** in **Figure 7** below carefully, then answer **question 36**.

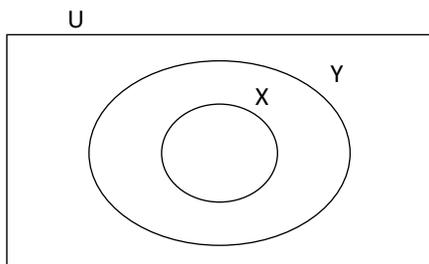


Figure 7

36. Which statement about the Venn diagram is **correct**?
- (A) X is a subset of Y (B) Y is a subset of X
(C) U is a subset of X (D) U is a subset of Y
37. Arrange the quantities $\frac{7}{10}$, 0.8, and 8% from **greatest to least**?
- (A) 8%, 0.8, $\frac{7}{10}$ (B) $\frac{7}{10}$, 0.8, 8%
(C) 0.8, $\frac{7}{10}$, 8% (D) 0.8, 8%, $\frac{7}{10}$
38. The cost of a cell phone was reduced from \$12 000 to \$9600. What was the percent decrease in the price of the cell phone?
- (A) 10% (B) 15%
(C) 20% (D) 25%



ANSWER EXPLANATIONS

QUESTION 1 ANSWER EXPLANATION

1. Which is an **even** number?

- (A) 76 818 (B) 83 059
(C) 88 967 (D) 99 701

This problem requires you to understand which numbers are considered even and which are considered odd.

Even numbers:	Odd numbers:
0, 2, 4, 6, 8	1, 3, 5, 7, 9

Regardless of how large or small the entire number is, we only consider the very last digit of the number for determining whether the entire number is considered even or odd.

Answer choices **B**, **C**, and **D** end with numbers 9, 7, and 1 respectively. All of these are odd numbers.

Answer choice **A** ends with an 8, one of the even numbers. **Answer choice A is correct.**

QUESTION 2 ANSWER EXPLANATION

2. What is the value of **6** in 25 673?

- (A) 60 (B) 600
(C) 6000 (D) 60 000

This question requires us to know that when we read a number from right to left, each position we move to the left requires us to add that many zeroes to the positions afterwards. Describing this in a sentence may sound confusing, but this is really another way of discussing numbers in expanded form (also called expanded notation).

The diagram below should help explain what that means:

T E N	T H O U S A N D S	H U N D R E D S	T E N S	O N E S
2	5	6	7	3

25 673
written in expanded form is
 $20\,000 + 5000 + 600 + 70 + 3$

Answer choice **B** is correct.

QUESTION 3 ANSWER EXPLANATION

3. Which shows the operation of division?

- (A) Includes 6 more objects (B) Decrease 15 by 6
(C) Make 6 greater by 15 (D) Share 15 among 6



Division means to distribute (usually evenly) into smaller groups. The final outcome will become smaller.

Answer **A** is suggesting we have more objects than what we started with, so this sounds like addition.

Answer **B** is getting smaller, but it is getting smaller by 6. This is really saying $15 - 6$. We are not distributing the starting total (in this case, 15) into even shares, so this is not division. This is subtraction.

Answer **C** is similar to answer **A** in the way it is saying to add two numbers together. More addition.

Answer **D** is saying take the 15 and distribute it amongst 6. This is an example of division. **Answer choice D is correct.**

QUESTION 4 ANSWER EXPLANATION

4. The sum of 10 and 407 is

(A) 470

(B) 417

(C) 397

(D) 307

The crucial understanding here is knowing that the word **sum** means addition. You need to add the numbers together. This is really just another way of asking you to evaluate this expression:

$$10 + 407 = ?$$

The answer is 417. **Answer choice B is correct.**

Multiple Choice Process of Elimination Tips:

Understanding that sum means adding numbers together to get a total that is larger than any of the individual numbers presented, we can eliminate any answers that are smaller than the highest number in the set of numbers being added. In this case, 407 is the largest number in the set of numbers being added, so we can eliminate answer choices **C** and **D** because they are both smaller than 407.

Study **Figure 1**, then answer **questions 5 and 6**.

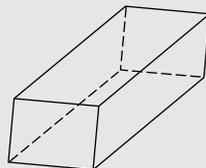


Figure 1

QUESTION 5 ANSWER EXPLANATION

5. The figure is called a

(A) cube.

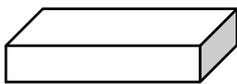
(B) cylinder.

(C) cuboid.

(D) sphere.

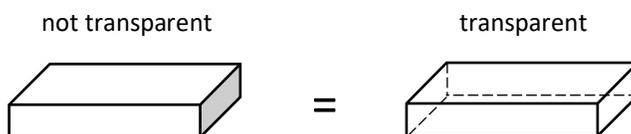


This question regarding geometrical shapes comes down to knowing what each one of these terms means.

			
cube	cylinder	cuboid	sphere
A cube is a box-shaped object. It is formed by six identical square faces joined along their edges. All angles are right angles.	A cylinder is shaped like a can. A cylinder is round and has a top and bottom in the shape of a circle. The top and bottom are flat and always the same size.	A cuboid is a box-shaped object. It has six flat faces, and all angles are right angles. All of its faces are <u>rectangles</u> , there are no squares .	A sphere is a geometrical figure that is perfectly round, 3-dimensional and circular - like a ball.

Answer choice C is correct.

It is important to understand that the dotted lines on the original shape represent the edges that are normally hidden from view. We would only be able to see these edges if the structure were transparent (see through). Shown below is the same cuboid shown in the non-transparent form and the transparent form:



QUESTION 6 ANSWER EXPLANATION

6. The figure has _____ sides.

- (A) 4 (B) 5
(C) 6 (D) 8

As discussed above, cuboids (and cubes) have 6 sides. **Answer choice C is correct.**

QUESTION 7 ANSWER EXPLANATION

7. A cricketer who scores one run less than a century has made _____ runs.

- (A) 19 (B) 99
(C) 101 (D) 111

The word century means 100. Perhaps the most common use of the word is in discussing a period of 100 years, but it can be used in other contexts.

If the cricketer scored on run less than a century, that is the same as saying one less than 100. We want:

$$100 - 1 = 99$$

Answer choice B is correct.



Multiple Choice Process of Elimination Tips:

What could we do if we did not know what the word century means? In a multiple-choice context, we could assume it probably means it is a “special number”, some kind of important number that would start a new level of numbers.

For example, it could be a number like 10, 100, 1000. Most likely, it would be a number that ended in a zero.

Think about it like a special birthday! Turning 10 seems a lot more exciting than turning 9. Think about turning 100!!

Since the problem is saying the cricketer scored one **less** than the “special number”, I would want to eliminate any choice that was not one less than what we’re calling a special number. Answer choices **C** and **D** are one number higher than a number that would have had a zero at the end, so I’d eliminate those. At least now we’re picking between 2 choices, not 4. Choosing between choices **A** and **C** means choosing between the numbers 20 and 100. Both end in zero, but if we have to just guess here, doesn’t 100 seem so much more deserving of a special name than 20?

QUESTION 8 ANSWER EXPLANATION

8. The unit used to measure the mass of heavy objects is

- (A) degree (B) kilogramme
(C) kilometre (D) litre

The question says we are measuring mass, so that means we are measuring the **weight** of something. If we consider the four answers and what they measure, we have:

A: degree = temperature	B: kilogramme = weight	C: kilometre = distance	D: litre = volume of liquid
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Answer choice **B** is correct.

QUESTION 9 ANSWER EXPLANATION

9. Which is the symbol for ‘not a member of’?

- (A) \in (B) \notin
(C) \cap (D) $\{ \}$

This is a question where it would be best to be familiar with these mathematical symbols.

\in “is a member of”	\notin “is not a member of”	\cap intersection	$\{ \}$ surrounds members in a set
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Answer choice **B** is correct.

QUESTION 10 ANSWER EXPLANATION

10. Which pair are equal sets?

- (A) $\{3, 7, 10, 8\}$ $\{6, 17, 13\}$
(B) $\{6, 10, 12, 5\}$ $\{60, 6, 10, 5\}$
(C) $\{3, 6, 8, 7\}$ $\{7, 3, 8, 6\}$
(D) $\{6, 0, 10, 7\}$ $\{5, 7, 0, 6\}$

Sets represent groups with the same exact members (called elements). We need to look at the individual numbers in the sets on the left and find which set on the right shares the exact same numbers. *The order in which the numbers (the elements) are listed is not important.* **Answer choice C is correct.**



QUESTION 11 ANSWER EXPLANATION

11. Which fraction represents 1%?

- (A) $\frac{1}{10}$
- (C) $\frac{1}{1000}$

- (B) $\frac{1}{100}$
- (D) $\frac{1}{10000}$

Percent (%) is a measurement of parts per 100.

1% is another way of saying 1 part per 100, or 1 out of 100.

With fractions:

- the number up top (above the line) is the numerator, and that tells us how many parts of the total we have.
- the number on the bottom (below the line) is the denominator, and that tells us how many total parts there are.

Since we are saying 1% is another way of saying 1 part out of 100, **answer choice B is correct.**

Figure 2 shows the favourite fruits of children in Grade Six. Study it, then answer **questions 12 and 13.**

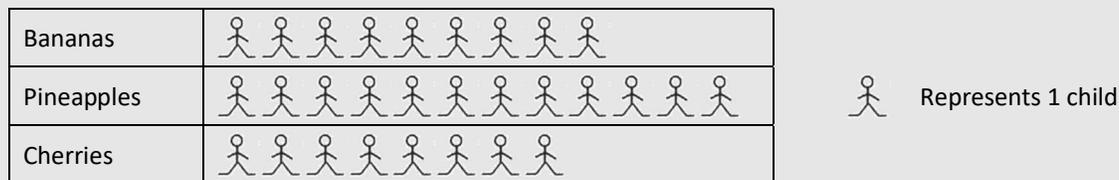


Figure 2

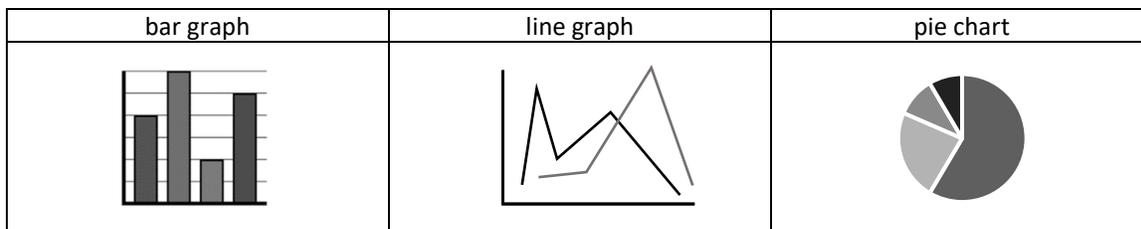
QUESTION 12 ANSWER EXPLANATION

12. The graph in **Figure 2** is called a

- (A) bar graph.
- (B) line graph.
- (C) pictograph.
- (D) pie chart.

The graph is using pictures to represent information – in this case, it shows us a stick-figure drawing as a representation for one child. This is an example of a pictograph. **Answer choice C is correct.**

Examples of the other types of graphs are as follows:



QUESTION 13 ANSWER EXPLANATION

13. Which tally marks represent the number of children who like **pineapples and cherries**?

- (A) TTTT TTTT TTTT TTTT
- (B) TTTT TTTT TTTT TTTT |
- (C) TTTT TTTT ||
- (D) TTTT TTTT TTTT TTTT TTTT ||||



Figure 2 told us that each picture of  represents one child. The chart indicates 12 children said pineapples are their favourite fruit, and 8 children said cherries are their favourite.

$$12 + 8 = 20 \text{ children}$$

We need to choose the answer that indicated 20.

The standard practice with showing tally marks is to show a slash line across 4 tally marks to quickly indicate a total of 5. In other words, when we see the symbol that looks like this:  we should expect that means 5. **Answer choice A is correct.**

QUESTION 14 ANSWER EXPLANATION

14. The number that comes before 7010 is

- (A) 7000 (B) 7009
(C) 7011 (D) 7090

By asking for a number that comes *before* 7010, we are being told to choose a number that is lower than 7010. We need a number smaller than 7010.

We should not choose answers **C** or **D** because both of these answers are higher than 7010. We need to avoid any number bigger than 7010.

The number that comes before 7010 would be:

$$7010 - 1 = 7009$$

Answer choice B is correct.

QUESTION 15 ANSWER EXPLANATION

15. The expanded form for 9074 is

- (A) $90 + 700 + 4$ (B) $900 + 70 + 4$
(C) $9000 + 7 + 4$ (D) $9000 + 70 + 4$

Expanded form or expanded notation is a way of writing numbers to see the math value of individual digits.

For the number presented to us, 9074, we can think of it like this:

T H O U S A N D S	H U N D R E D S	T E N S	O N E S
9	0	7	4

9074
written in expanded form is

$$9000 + 000 + 70 + 4$$

- or -

$$9000 + 70 + 4$$

Answer choice D is correct.



QUESTION 16 ANSWER EXPLANATION

16. $1.900 - 0.149 =$

- (A) 0.751 (B) 1.751
(C) 1.851 (D) 1.811

We have subtraction that involves decimal places, so we have to align the decimal points like this:

$$\begin{array}{r} 1.900 \\ - 0.149 \\ \hline ? \end{array}$$

Now we can do the subtraction and get the answer:

$$\begin{array}{r} 1.900 \\ - 0.149 \\ \hline 1.751 \end{array}$$

Answer choice B is correct.

QUESTION 17 ANSWER EXPLANATION

17. $60.5 \div 100 =$

- (A) 60 500 (B) 6050
(C) 6.05 (D) 0.605

Dividing by factors of 10 (example: 10, 100, 1000, 10 000) allows us to move the decimal point to the left the same number of positions as we have zeros in the factor. If we need to move the decimal more positions than we have numbers to the left of the decimal, we will need to write in additional zeros between the new position of the decimal point and what was originally shown as the first number.

In this example using the number 60.5, there are two numbers to the left of the decimal. If we were to move the decimal point 3 or more positions to the left, we would need to add in extra zeros.

$60.5 \div 10 = 6.05$	10 has 1 zero after the 1, we move the decimal over 1 position to the left.
$60.5 \div 100 = 0.605$	100 has 2 zeros after the 1, we move the decimal over 2 positions to the left.
$60.5 \div 1000 = 0.0605$	1000 has 3 zeros after the 1, we move the decimal over 3 positions to the left. Note that we needed to write in an additional zero after the decimal, but before the number 6.
$60.5 \div 10\,000 = 0.00605$	10 000 has 4 zeros after the 1, we move the decimal over 4 positions to the left. Note that we needed to write in two additional zeros after the decimal, but before the number 6.

Answer choice D is correct.

QUESTION 18 ANSWER EXPLANATION

18. What is the LCM for 12, 18, and 24?

- (A) 6 (B) 24
(C) 54 (D) 72



LCM stands for lowest common multiple. You can find the LCM in two ways. **The first way** is by writing down the multiples of each number of the set we are given.

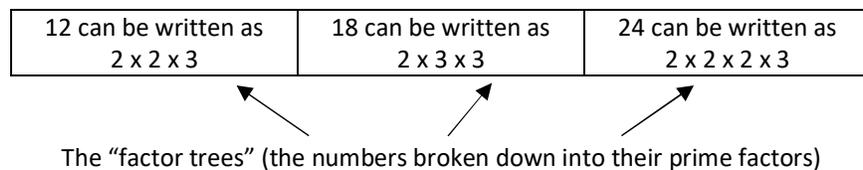
A multiple of a number is the product of that number with another number. Write out a few multiples for each member of the set until you find the first example of the same number showing up as a multiple for all the members of the set.

Suggestion: For whatever the largest number is in the set of numbers being evaluated (in our example, it is the number 24), write out the first 3 multiples. Most likely, the answer is going to be one of those numbers.

Write down the multiples of 12. This would be: 12x1 12x2 12x3 etc. the multiples: 12, 24, 36, 48, 60, 72	Write down the multiples of 18. This would be: 18x1 18x2 18x3 etc. the multiples: 18, 36, 54, 72	Write down the multiples of 24. This would be: 24x1 24x2 24x3 etc. the multiples: 24, 48, 72
---------------------------------------------------------------------------------------------------------------------------------	-------------------------------------------------------------------------------------------------------------------------	---------------------------------------------------------------------------------------------------------------------

In this example, we see the number 72 is the first example of a multiple that shows up in all 3 of the boxes. Because it is in all 3 of the boxes, it is the lowest common multiple. **Answer choice D is correct.**

The second way to solve this is using **prime factorization**. With this technique, we break down the original numbers in the set into their prime factors. This technique is sometimes called creating a factor tree.



For each factor tree, identify which tree shows each prime number showing up the most times. In our example above, the only prime numbers we have are 2 and 3. Prime number 2 shows up three times in the tree for 24, and prime number 3 shows up twice in the tree for 18.

It is probably easier to understand what was written in the previous paragraph by using a chart.

Below, we have a chart where we show the numbers of the original set across the top, and on the left is the prime numbers that showed up in the factor trees. We write down how many times each prime factor shows up in each tree.

Then, read the horizontal rows and circle the largest number of times a factor shows up in each horizontal row.

# from set	12	18	24
prime factor			
2	twice	once	three times
3	once	twice	once

The circled parts of the chart are now telling us how many times we use each prime factor in a multiplication equation that will give us our answer. In this example, we want to do this:

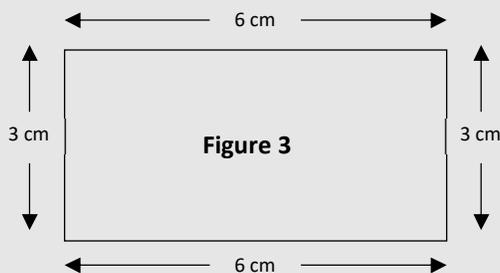
$$2 \times 2 \times 2 \times 3 \times 3 = \text{answer to this LCM question.}$$

$$\text{Could also write as } (2^3) (3^2) = \text{answer to this LCM question.}$$

Once again, the answer comes out to 72.



Study **Figure 3**, then answer **question 19**.



QUESTION 19 ANSWER EXPLANATION

19. How many lines of symmetry can be drawn in **Figure 3** above?

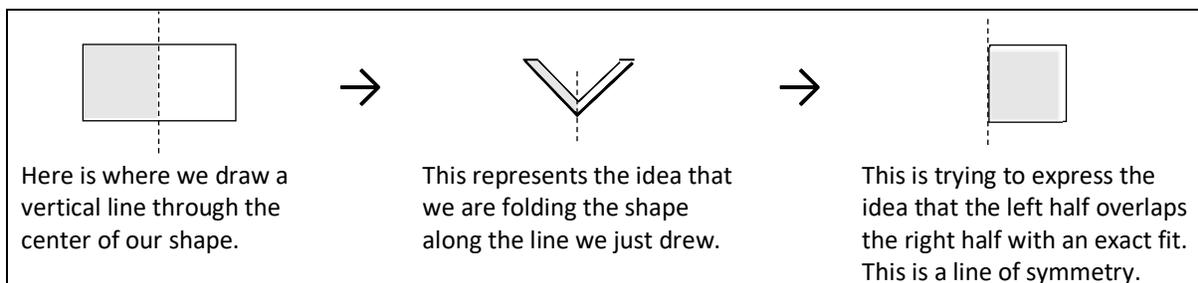
- (A) 2
- (B) 4
- (C) 6
- (D) 8

A line of symmetry occurs when we can draw a line through the middle of our shape, fold the shape on this line, and now have both halves of the folded shape touching each other like an exact mirror image. All the edges of one side need to be lined up exactly with the edges on the other side. It is probably easier to understand this with pictures, and we can use the rectangle presented to us in **Figure 3**.

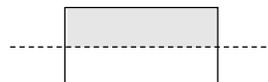
Recall that a rectangle is defined as having four sides and four right angles (90° angles), and each set of parallel sides is the same length as each other. However, we do not have all four of the sides being the same length because that would be the definition of a square.

To make it easier to visualize, the rectangle has been shaded on one half so we can follow it as we fold the structure in half.

The first line of symmetry is vertical. If we fold the rectangle on this line (imagine we were closing an open book), the two halves would line up on each other exactly.



The second line of symmetry could be drawn horizontally like this:



Now here is where we need to be careful. **Regular polygons** are defined as shapes that are equiangular (all angles are equal in measure) and equilateral (all sides have the same length). For regular polygons, we can say that we have the same number of lines of symmetry as we have sides of the shape. For example, a square will have four sides of equal length, so a square will have 4 lines of symmetry.

A rectangle is not considered a regular polygon. This means we will have less lines of symmetry than we have sides of the shape. If we were to draw a line diagonally through the center and then fold the structure across this line, the halves will not line up correctly.



Testing a line drawn diagonally through the center.

Oh no! The two halves do NOT overlap exactly. This is NOT a line of symmetry.

Rectangles have 2 lines of symmetry.
Answer choice A is correct.



Study **Figure 4**, then answer **questions 20 and 21**.

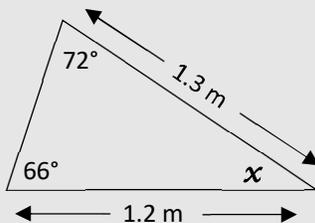


Figure 4

QUESTION 20 ANSWER EXPLANATION

20. The value of the angle marked x in **Figure 4** is

- (A) 138°
- (B) 72°
- (C) 66°
- (D) 42°

The three angles of all triangles need to add up to 180° . Here we are told the measurements of two of the angles, so we can start by adding those together:

$$\begin{array}{r} 72^\circ \\ + 66^\circ \\ \hline 138^\circ \end{array}$$

To figure out the value for x , we can subtract this total of 138° from 180° .

$$\begin{array}{r} 180^\circ \\ - 138^\circ \\ \hline 42^\circ \end{array}$$

Answer choice D is correct.

QUESTION 21 ANSWER EXPLANATION

21. The **perimeter** of **Figure 4** is 3 m, the length of the third side is

- (A) 3.5
- (B) 2.5
- (C) 0.5
- (D) 0.1

Perimeter always means the total length when we add together all the sides of a shape.

The problem is telling us the perimeter is 3 metres, and **Figure 4** tells us the lengths of two of the three sides.

We can start by adding together the lengths that we are given (1.3 m and 1.2 m):

$$\begin{array}{r} 1.3\text{ m} \\ + 1.2\text{ m} \\ \hline 2.5\text{ m} \end{array}$$



To now find the length of the third side, we can subtract 2.5 m from the total perimeter of 3 m.

$$\begin{array}{r} 3.0 \text{ m} \\ - 2.5 \text{ m} \\ \hline 0.5 \text{ m} \end{array}$$

Answer choice C is correct.

QUESTION 22 ANSWER EXPLANATION

22. One face of a cube has a surface area of 12 cm². What is the **total** surface area, in cm², of the cube?

- (A) 72 (B) 48
(C) 24 (D) 12

A cube is a shape made up of 6 squares. It is the shape of dice.



Because they are squares, all 6 sides have the same measurements for lengths. We are told one face of the cube has a surface area of 12 cm², so this means all 6 sides have that same surface area. For us to get the total surface area, we need to add up the surface areas of all the sides. Because this is a cube, we can multiply 12 cm² by 6 because that is the same as saying do 12 + 12 + 12 + 12 + 12 + 12.

$$12 \times 6 = 72$$

Answer choice A is correct.

QUESTION 23 ANSWER EXPLANATION

23. How many subsets can be formed from the set {x, y, z}?

- (A) 2 (B) 4
(C) 6 (D) 8

Even though it was not used in the problem, it is important to know that the symbol \subseteq means "is a subset of".

A subset is a set whose elements are all members of another set.

For any given set, we always have the subset that is a repeat of the original set and the subset that contains no elements. In addition to those two subsets, we have subsets that contain each individual element and we have subsets that contain every combination of two elements.

Showing all the subsets for set {x, y, z}

repeat of the original	contains every combination of two elements	contains each individual element	contains no elements
{x, y, z}	{x, y} {x, z} {y, z}	{x} {y} {z}	{ }



If we had been given a set that contained more than 3 elements, we would have had more subsets. For example, if we had been given a set with 5 elements, we would have subsets with 0, 1, 2, 3, 4, and 5 elements.

From our chart above, we see that we have 8 subsets. **Answer choice D is correct.**

Is there a faster way to get this answer? YES!

Faster way to answer: When asked how many subsets exist for a set, we can use the formula 2^n where n = the number of elements in the set.

In this specific example of having the set $\{x, y, z\}$, we have 3 elements in the set. 2^3 leads to the answer of 8.

$$2^3 = (2 \times 2 \times 2) = 8$$

Study the Venn diagram in **Figure 5**, then answer **questions 24 and 25**.

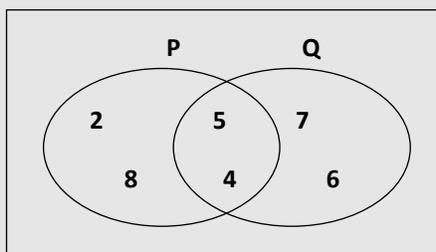


Figure 5

QUESTION 24 ANSWER EXPLANATION

24. The members in set P **only** are

- | | |
|----------|----------|
| (A) 2, 8 | (B) 4, 5 |
| (C) 6, 7 | (D) 2, 5 |

When the question asks for members in set P **only**, we must not choose any members considered part of Q.

Circle P is holding numbers 2, 8, 5, and 4.

Circle Q is holding numbers 7, 6, 5, and 4.

Here, we see numbers 5 and 4 are common to both P and Q, but we have to choose the members **only** in P. That would be 2 and 8. **Answer choice A is correct.**

QUESTION 25 ANSWER EXPLANATION

25. What is the sum of the members in the Venn diagram?

- | | |
|--------|--------|
| (A) 19 | (B) 22 |
| (C) 23 | (D) 32 |

The members in the Venn diagram are **all** the values shown in the diagram. This question wants us to sum up the six values displayed.

$$2 + 8 + 5 + 4 + 7 + 6 = 32$$

Answer choice D is correct.



QUESTION 26 ANSWER EXPLANATION

26. What is 20% of 900?

(A) 450

(B) 225

(C) 180

(D) 80

Percentages are fractions. They mean “per cent”, or “per 100”. 20% can be expressed as $\frac{20}{100}$.

To find 20% of 900, we multiply $\frac{20}{100}$ by 900. In this situation, we have the opportunity to cross out some zeros.

$$\left(\frac{20}{100} \times 900\right) \text{ can be simplified to } \left(\frac{20}{100} \times 900\right) \text{ which can now be written as } \left(\frac{20}{1} \times 9\right)$$

$$20 \times 9 = 180$$

The final answer is 180. **Answer choice C is correct.**

We have other ways to solve this faster. If we recognize that 20% means take 10% of the number, then double that value, we can perhaps solve faster. Using some ideas developed in problem 17, we could say 10% represents a number divided into 10 equal parts. We can get that value by dividing the original number (900) by 10. Since we’re dividing by 10, we take the original number and move the decimal point over one position to the left.

$$900.0 \div 10 = 90.0$$

Because we want 20% of 900, we could take this answer of 10% and then double it to 180.

QUESTION 27 ANSWER EXPLANATION

27. A pair of shoes which costs \$6000 was decreased by 40%. What is the new price of the pair of shoes?

(A) \$2400

(B) \$3600

(C) \$5960

(D) \$8400

The problem is telling us the shoes have been decreased in price. Right away, this eliminates answer choice **D** because that is a higher price than the initial \$6000.

If we’re going to set up a math equation to solve this, we can use information discussed in problem 26 and do this. We want to first calculate the amount of the percentage, then subtract that from the original price as follows:

$$\$6000 - \left(\$6000 \times \frac{40}{100}\right) = \text{answer}$$

$$\text{We can cross out some zeros: } \$6000 - \left(\$6000 \times \frac{40}{100}\right) = \text{answer}$$

$$\$6000 - (\$2400) = \text{answer}$$

$$\$3600 = \text{answer}$$

Answer choice B is correct.

We could use some quick skills too by recognizing we are marking it down 40%, which means we are subtracting 10% of the original value four times. In other words, we recognize 10% of \$6000 is \$600, and we subtract that four times from the original \$6000.



QUESTION 28 ANSWER EXPLANATION

28. $12 : 8 = 36 : x$. What is the value of x ?

- (A) 8 (B) 12
(C) 24 (D) 30

Here we are being asked to recognize a ratio. When we see $12 : 8 = 36 : x$, we can also express it this way:

$$\frac{12}{8} = \frac{36}{x}$$

From here, we have a few different ways to solve this. Perhaps we recognize the first fraction of $12/8$ has a lowest common factor of 4, so we could divide both values by 4 and rewrite this equation as this:

$$\frac{3}{2} = \frac{36}{x}$$

Now we can do cross-multiplication like this to set up an equation that is not using fractions:

$\frac{3}{2} = \frac{36}{x}$ will give us an equation $3x = 72$

Dividing each side by 3 gives us $x = 24$

Answer choice C is correct.

Another way we could have solved this was to see the numerator on the left (3) could have been multiplied by 12 to then match the numerator on the right (36). Using the idea that we can multiply by 1 and not change values, we could have set up an equation like this where we multiply the fraction on the left by $\frac{12}{12}$:

$$\left(\frac{3}{2}\right) \times \left(\frac{12}{12}\right) = \frac{36}{x}$$

Now we can see that $x =$ the product of 2×12 , which is 24.

QUESTION 29 ANSWER EXPLANATION

29. The average of six numbers is 14. If the total for **five** of the number is 70, what is the sixth number?

- (A) 12 (B) 14
(C) 35 (D) 70

We are told that the average of 6 numbers is 14. Average (which can also be called “mean”) is calculated by taking the total sum of all the numbers we have and then dividing that sum by the number of numbers we have. Here:

$$\text{Average} = \frac{\text{sum of the six numbers}}{6} = 14$$

Doing some cross multiplication with that formula could allow us to also say:

$$6 \times 14 = \text{the sum of the six numbers, and this calculates to 84.}$$

The problem tells us five of the numbers add up to 70, so to calculate the sixth number, we do $84 - 70 = 14$.

Answer choice B is correct.



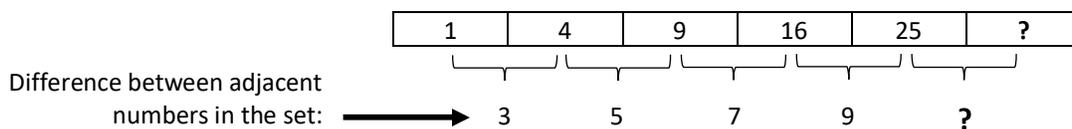
QUESTION 30 ANSWER EXPLANATION

30. What is the next number in the sequence 1, 4, 9, 16, 25?

- (A) 33 (B) 34
(C) 35 (D) 36

Problems asking us about a sequence are asking us to identify a repeating pattern. Start by checking the difference between the numbers each time you move on to the next number. By this, I mean subtract the first number from the second number, then subtract the second number from the third, and see if we see a pattern.

Taking a look at the sequence we have been given for this problem, we see the following:



Here, we see a pattern where the difference between each set of numbers is 2 higher than the previous. Following this pattern, we could predict the difference should be 11 between number 25 and the next number, our answer.

$$25 + 11 = 36$$

Answer choice D is correct.

Another notable pattern about this particular set of numbers is each successive value is the result of squaring a number. We have $1^2 = 1$, then $2^2 = 4$, then $3^2 = 9$, so if we continue following that pattern, the sixth number should be $6^2 = 36$, which it is.

QUESTION 31 ANSWER EXPLANATION

31. The **largest** number is

- (A) 8.893 (B) 8.889
(C) 8.763 (D) 8.762

We are being asked to recognize the largest number when we are working with decimals. The portion to the right of the decimal means we have more than just the whole number to the left of the decimal, but we still have less than the number to the left of the decimal + 1.

8.001 is more than 8. If we wanted to, we could write 8 as 8.000. We are saying 8.001 is more than 8.000.

But 8.999 is still less than 9. This is an example of saying even though we have lots of 9's to the right of the decimal, we still look at the whole numbers to the left of the decimal and say that the 9 of 9.000 is still higher than the 8 of 8.999.

In this problem, all four answers start with an 8 to the left of the decimal. All we need to do is choose which 3-digit number to the right of the decimal is the largest. For the choices listed, we have $.893 > .889 > .763 > .762$

Answer choice A is correct.

QUESTION 32 ANSWER EXPLANATION

32. 9, 12, and 15 is to 3 as 15, 20, and 25 is to

- (A) 2 (B) 5
(C) 7 (D) 10



Here we have pattern recognition, let's see what we can recognize about the two sequences.

In the first sequence of 9, 12, and 15, we have the numbers increasing by 3 each time. The problem actually says 9, 12, and 15 is to **3**, so we can consider that this number 3 is actually telling us the number we increase with each successive number.

In the second sequence of 15, 20, and 25, we have the numbers increasing by 5 each time. Using the logic from the first part of the problem, we can choose the answer **5**. **Answer choice B is correct.**

Study **Figure 6**, then answer **question 33**.



Figure 6

QUESTION 33 ANSWER EXPLANATION

33. The value of y is

- (A) 20° (B) 117°
(C) 120° (D) 243°

The shape above is a quadrilateral. A quadrilateral has four straight sides, it has four vertices (meaning four corners), and has interior angles that add up to 360° .

We have been given the angle measurements of three of the 4 corners, so we can add those up and then subtract from 360° .

$$360^\circ - (100^\circ + 83^\circ + 60^\circ) = \text{the answer}$$

$$360^\circ - 243^\circ = \text{the answer} = \mathbf{117^\circ}$$

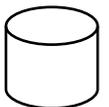
Answer choice B is correct.

QUESTION 34 ANSWER EXPLANATION

34. When Lalita poured 3 litres of water into an empty upright cylindrical metal drum, 1 cm of the bottom was covered. If the drum is 1 m high, what is the capacity of the drum in litres?

- (A) 3 (B) 10
(C) 30 (D) 300

The problem suggests we need to figure out the volume of a cylinder (the figure shown to the right), a calculation that uses the equation $V = \pi r^2 h$ where V = volume, π is a constant, r = radius, and h = height.



However, with the information provided in the problem, we can solve this without using that equation. We are told that 3 litres of water fills the drum by 1 cm. We are also told the drum is 1 m tall. If we know how many centimetres it takes to reach 1 metre, we can solve this problem. The prefix "centi-" means 100 (similar to century). There are 100 centimetres in 1 metre.

Knowing that it takes 3 litres of water to fill the drum up 1 cm, we can calculate the capacity by saying it requires 3 litres of water being poured in 100 times.

$$100 \times 3 = 300$$

Answer choice D is correct.



QUESTION 35 ANSWER EXPLANATION

35. Fazil began doing his homework assignments at 17:05 h and finished at 19:35 h. The number of minutes Fazil took to complete his homework assignments was
- (A) 150 (B) 120
(C) 90 (D) 65

In concept, all we need to do is subtract the start time from the end time to figure out how long it took Fazil to do his homework assignment. But we have the challenge of minutes going up to 59, then turning to 0. This can make subtracting one time from another somewhat challenging.

This problem becomes a lot easier if the beginning time started at zero minutes. We could do some adjusting of the times where we either subtract an equal number of minutes away from the starting and ending times, or we add an equal number of minutes to the starting and ending times.

In this example presented by the problem, Fazil started at 17:05. We could subtract 5 minutes from both the starting and ending times so we can now be working with numbers 17:00 and 19:30. It becomes easier to see that Fazil spent 2 hours and 30 minutes doing homework.

One hour is 60 minutes, so we still need to convert the 2 hours into minutes and then add that to 30 minutes.

$$(2 \times 60) + 30 = \text{total number of minutes}$$
$$120 + 30 = 150 \text{ minutes}$$

Answer choice A is correct.

Let's do an additional example where we subtract.

Let's say Fazil had started at 17:40 and finished at 19:18. In this case, we could add 20 minutes to the starting and ending times so we could now work with the values 18:00 and 19:38. This allows us to quickly see the time span was 1 hour and 38 minutes, and if we needed to convert into minutes, we would have $60 + 38 = 98$ minutes.

Study the **Venn Diagram** in **Figure 7** below carefully, then answer **question 36**.

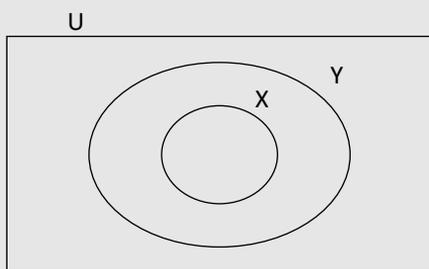


Figure 7

QUESTION 36 ANSWER EXPLANATION

36. Which statement about the Venn diagram is **correct**?
- (A) X is a subset of Y (B) Y is a subset of X
(C) U is a subset of X (D) U is a subset of Y



A subset is a set whose elements are all members of another set. The subset must be inside another group.

This Venn diagram shows that X is inside Y, and both X and Y are inside U.

Answer choices **C** and **D** are incorrect because they both say that U is inside other elements. That is not true.

Answer choice **B** is saying Y is inside X, but that is also incorrect.

Answer choice **A** has accurate information by saying X is inside Y. **Answer choice A is correct.**

Multiple Choice Process of Elimination Tips:

What can we do if we encounter a problem that uses terminology we do not know the definitions for? For example, what if we did not know what the term “subset” means?

In a multiple-choice context, we could see if you can recognize any patterns with the four answers. If you can, perhaps three of the answers will all say one thing while the fourth answer says the opposite. Often, the single answer saying the opposite is the correct answer.

For example, in this problem, after looking at the Venn diagram, we could notice that some shapes are inside the others and then turn the word “subset” into either “inside” or “outside”, depending on which is correct. If we did that, we would answer choices that now look like this:

- | | |
|-----------------------|-----------------------|
| (A) X is INSIDE of Y | (B) Y is OUTSIDE of X |
| (C) U is OUTSIDE of X | (D) U is OUTSIDE of Y |

Suddenly we see that answer choice **A** is different than the other 3. If I were in a situation where I didn’t know the actual information being presented, I would use this approach to solve this question.

QUESTION 37 ANSWER EXPLANATION

37. Arrange the quantities $\frac{7}{10}$, 0.8, and 8% from **greatest to least**?

- | | |
|------------------------------|------------------------------|
| (A) 8%, 0.8, $\frac{7}{10}$ | (B) $\frac{7}{10}$, 0.8, 8% |
| (C) 0.8, $\frac{7}{10}$, 8% | (D) 0.8, 8%, $\frac{7}{10}$ |

This problem becomes a lot easier if the three quantities are presented in the same format. Using information discussed in problems 11 and 17, we can convert values into decimals very quickly.

$\frac{7}{10} = 0.7$
In problem 17, we discussed how to quickly divide by 10 and 100. Here we are dividing by 10, so we move the decimal in the numerator over 1 position to the left.

0.8
largest (greatest)

$8\% = \frac{8}{100} = 0.08$
In problem 11, we discussed that 8% means 8 parts out of 100. Now we are dividing by 100, so we move the decimal in the numerator over 2 positions to the left.
smallest (least)

Answer choice C is correct.



QUESTION 38 ANSWER EXPLANATION

38. The cost of a cell phone was reduced from \$12 000 to \$9600. What was the percent decrease in the price of the cell phone?
- (A) 10% (B) 15%
(C) 20% (D) 25%

When we know the starting price and the lower price, we can calculate the percent decrease in price by using the following equation:

$$\frac{\text{difference in price}}{\text{original price}} \times 100\% = \text{percent change}$$

We start by first getting the difference in price. We calculate by subtracting the lower price from the original price:

$$\begin{array}{r} \$12000 \\ - \$9600 \\ \hline \$2400 \end{array}$$

Now we divide this difference by the original price, then multiply by 100% to calculate our percentage change.

$$\frac{\$2400}{\$12000} \times 100\%$$

We can do some math to make it easier. Let's start by multiplying by 100%. We add two zeros to the numerator, and we also do not need to write in the dollar signs anymore since these units cancel each other out.

$$\frac{\$2400}{\$12000} \times 100\% = \frac{240000}{12000}\%$$

Now we can cross out the same number of zeros in the numerator as we cross out in the denominator to make the number easier to work with.

$$\frac{240000}{12000}\% = \frac{240}{12}\%$$

Finally, it comes down to dividing 240 by 12. Doing that math gives us a final answer of 20%.

Answer choice C is correct.



