Year 9 Quiz 1 Solutions - Cambridge Checkpoint 2023

J. Dittenber, M.S.

This examination has 15 questions, for a total of 30 points and 0 bonus points.

Answer the questions in the spaces provided on the question sheets. If you run out of room for an answer, continue on the back of the page.You must show all of your work for credit

Full Name in English: ______________________________

Nickname: ______________________________

No Calculator Allowed. You must show all of your work for credit

Some Useful Formulas

1. $a^m \times a^n = a^{m+n}$
2. $a^m \div a^n = \frac{a^m}{a^n} = a^{m-n}$
3. If $a \neq 0$, $a^0 = 1$
4. $\frac{1}{a^{-n}} = a^n$, $a^{-n} = \frac{1}{a^n}$
5. $\sqrt[n]{a} = a^{\frac{1}{n}}$, $\sqrt[n]{a^m} = a^{\frac{m}{n}}$
6. $(a^m)^n = a^{m \times n}$
7. $(a^n \times a^m)^p = a^{n \times p} \times a^{m \times p}$

Number Sets and Operations

INSTRUCTIONS Choose the most correct answer.

1. (2 points) Evaluate each choose which choice has the correct answer for each a.,b.,c. and d.:

   a. $2 \times -10 =$

   b. $-18 + (-2) =$

   c. $-40 \div 2 =$

   d. $-22 + 2 =$

   The correct answer is A

   A. $-20, -20, -20, -20$

   B. $-20, 20, -20, 20$

   C. $20, -20, 20, -20$

   D. $20, 20, 20, 20$

2. (2 points) Choose the most correct answer.

   Consider the following numbers:

$$-3.7, \sqrt{13}, \frac{3}{8}, \sqrt[3]{1}, \sqrt{3} \times 13$$

   The correct answer is D

   A. The rational numbers are: -3.7, $\sqrt{13}$, $\frac{3}{8}$, $\sqrt[3]{1}$, $\sqrt{3} \times 13$

   B. The irrational numbers are:$\sqrt{13}$, $\frac{3}{8}$, $\sqrt{3} \times 13$

   C. The rational numbers are:$\sqrt{13}$, $\sqrt{3} \times 13$

   D. The irrational numbers are:$\sqrt{13}$, $\sqrt{3} \times 13$

3. (2 points) Show that

$$\sqrt{3} \times \sqrt{27}$$

   is an integer.

   $\sqrt{3} \times \sqrt{27} = \sqrt{3 \times 27} = \sqrt{3 \times 3^3} = \sqrt{3^4} = \sqrt{81} = 9$

4. (2 points) Write down two irrational numbers with the sum of 0. There are many possible correct solutions.

$$\sqrt{2} + -\sqrt{2} = 0$$

5. (2 points) Write each of these numbers without using indices.

   a. $-3^0 = -1 \times 3^0 = -1 \times 1 = -1$

   b. $(-3)^3 = -27$

   c. $(-3)^{-2} = \frac{1}{(-3)^2} = \frac{1}{9}$

6. (2 points) Find an irrational number that is between:

   a 3 and 4

   The process must be shown:

$$3^2 < n^2 < 4^2$$
$$9 < n^2 < 16$$
$$9 < 11 < 16$$
$$\sqrt{9} < \sqrt{11} < \sqrt{16}$$
$$3 < \sqrt{11} < 4$$

   Therefore, an irrational number between 3 and 4 is $\sqrt{11}$.

   b 11 and 12

   Use the same technique as above.
   $11 < n < 12$
   $11^2 < n^2 < 12^2$
   $121 < n^2 < 144$
   $121 < 131 < 144$
   $\sqrt{121} < \sqrt{131} < \sqrt{144}$
   $11 < \sqrt{131} < 12$
   Therefore an irrational number between 11 and 12 is $\sqrt{131}$

7. (2 points) Write these numbers in standard form.

- 8 420 000
- 0.000 112 8

Recall that a number in standard form is written

$$a \times 10^n$$

where

$$1 \leq a < 10$$

and n is an integer.

$8420000 = 8.42 \times 10^6$
$0.0001128 = 1.128 \times 10^{-4}$

8. (2 points) Here are three numbers:

$$x = 2.5 \times 10^{-3}$$
$$y = 2.5 \times 10^{3}$$
$$z = 2.5 \times 10^{0}$$

a. Write down number x in full. $x = 0.0025$

b. List the three numbers in order of size, smallest first. x,z,y

9. (2 points) Here is a statement:

$$15 < \sqrt{290} < 16$$

Is the statement true or false? Show your work that gives a reason for your answer.

The student must show this process:

$$15 < \sqrt{290} < 16$$
$$15^2 < (\sqrt{290})^2 < 16^2$$
$$225 < 290 < 256$$

False because $290 \not< 256$

10. (2 points) Here is a statement:

$$2 < \sqrt[3]{26} < 3$$

Is the statement true or false? Show your work that gives a reason for your answer.

The student must show this process:

$$2 < \sqrt[3]{26} < 3$$

$$2^3 < (\sqrt[3]{26})^3 < 3^3$$

$$8 < 26 < 27$$

True.

11. (2 points) Use the prime factorisation method to find the HCF and LCM for 75 and 125. Be sure to use the factor tree.

Solution:

Let's start by finding the prime factorisation of 75 and 125 using factor trees:

Factor tree for 75:

$$75$$
$$3 \times 25$$
$$5 \times 5$$

Factor tree for 125:

$$125$$
$$5 \times 25$$
$$5 \times 5$$

Prime factorisation of 75: $75 = 3 \times 5^2$.

Prime factorisation of 125: $125 = 5^3$.

To find the HCF, we take the common prime factors raised to the lowest powers: $\text{HCF}(75, 125) = 5^2 = 25$.

To find the LCM, we take the product of all prime factors with the highest powers: $\text{LCM}(75, 125) = 3 \times 5^3 = 375$.

Therefore, the HCF of 75 and 125 is 5, and the LCM is 375.

Tests for Divisibility

12. (2 points) Is the number 4484808 divisible by 3? Demonstrate if it is or not using tests for divisibility. Do not simply divide the number.

Solution:

To determine if the number 4484808 is divisible by 3, we can use the test for divisibility by 3, which states that a number is divisible by 3 if the sum of its digits is divisible by 3.

Let's find the sum of the digits of 4484808:

$$4 + 4 + 8 + 4 + 8 + 0 + 8 = 36$$

Since the sum of the digits, which is 36, is divisible by 3, we can conclude that 4484808 is divisible by 3.

Therefore, the number 4484808 is divisible by 3 according to the test for divisibility.

13. (2 points) Write each number as a power of 3.

 a. 9
 b. $\frac{1}{27}$
 c. 0

Solution:

a. To express 9 as a power of 3, we can write it as 3^2.

b. To express $\frac{1}{27}$ as a power of 3, we can rewrite it as $\frac{1}{3^3} = 3^{-3}$.

c. The number 0 cannot be expressed as a power of 3. Any non-zero positive number raised to the power of 0 is equal to 1, but 0 itself cannot be written as a power of 3.

Indices and Roots

14. (2 points) Write as $2^3 \times 2^2$ as a power of 2.

Solution:

We can simplify $2^3 \times 2^2$ as follows:

$$2^3 \times 2^2 = 2^{3+2} = 2^5$$

Therefore, $2^3 \times 2^2$ can be written as 2^5.

15. (2 points) Write as $4^3 \times 4^{-2}$ as a power of 4.

Solution:

We can simplify $4^3 \times 4^{-2}$ as follows:

$$4^3 \times 4^{-2} = 4^{3+(-2)} = 4^1$$

Therefore, $4^3 \times 4^{-2}$ can be written as $4^1 = 4$.