

# **Arithmetic Assessment**

**Answer Key & Explanations**

## ANSWER KEY

1. C  
2. C  
3. D  
4. B  
5. B  
6. C  
7. C  
8. B  
9. B  
10. B  
11. E  
12. B  
13. D  
14. B  
15. E  
16. B  
17. A

18. E  
19. E  
20. C  
21. E  
22. E  
23. E  
24. C  
25. B  
26. E  
27. B  
28. A  
29. A  
30. E  
31. A  
32. E  
33. C  
34. C

35. B  
36. B  
37. C  
38. A  
39. C  
40. D  
41. C  
42. A  
43. B  
44. A  
45. E  
46. C  
47. D  
48. C  
49. C  
50. A

## ANSWER EXPLANATIONS

### 1. Answer: C

First, observe that three fourths is  $\frac{3}{4}$  and one tenth is  $\frac{1}{10}$ . Let  $x$  be the unknown part which must be found. Then, one can write from the statement of the problem that the  $x$  part of three fourths is given by:

$$\frac{3}{4} x$$

The equation for the problem is given by

$$\frac{3}{4} x = \frac{1}{10}$$

Multiplying both sides of the equation by the reciprocal of  $\frac{3}{4}$  one obtains the following:

$$\frac{4}{3} \frac{3}{4} x = \frac{4}{3} \frac{1}{10} \text{ or } x = \frac{4}{30} \text{ or } x = \frac{2}{15}$$

which is choice (C)

Response (D) is obtained by incorrectly finding the product of  $\frac{3}{4}$  and  $\frac{1}{10}$  to be the unknown part. Response (B) is obtained by dividing  $\frac{3}{4}$  by  $\frac{1}{10}$ .

### 2. Answer: C

Based on the information given in the first sentence of the problem one needs to first represent the unknown numbers. So let  $x$  be a number. Then, the other number is given by  $3x + 2$ , which is two more than 3 times the first number. So the two numbers are:

$$\mathbf{x \text{ and } 3x + 2}$$

Next, form an equation by adding the two numbers and setting the sum equal to 22 and then solve the equation for the two numbers.

$$x + 3x + 2 = 22$$

$$4x + 2 = 22$$

$$4x = 20$$

$$x = 5,$$

one of the numbers. The other number is given by

$$3x + 2 = 3(5) + 2 = 15 + 2 = 17$$

the other number. Hence, answer choice (C) is correct.

### 3. Answer: D

To find the median let's put the sequence in ascending order first.

13, 18, 26, 26, 26, 26, 27, 27, 27, 27, 29, 30, 30, 30, 36, 36

Since there are 16 terms in total, median is the average of 8<sup>th</sup> and 9<sup>th</sup> term.

So, median =  $(27+27)/2 = 27$ .

**4. Answer (B)**

In order to find what percent of 260 is 13 one needs only to form the following equation:

$$x\%(260) = 13$$

$$\frac{x(260)}{100} = 13$$

$$260x = 13(100)$$

$$x = 1300 / 260 = 5 \text{ percent} = 5\%$$

**5. Answer (B)**

$$\begin{aligned} 4\frac{1}{3} - 1\frac{5}{6} &= 4\frac{2}{6} - 1\frac{5}{6} \\ &= 3\frac{2+6}{6} - 1\frac{5}{6} \\ &= 3\frac{8}{6} - 1\frac{5}{6} \\ &= 2\frac{3}{6} = 2\frac{1}{2} \end{aligned}$$

**6. Answer (C)**

Observe that to find the product the following multiplications should be done.

$$\begin{aligned} (\sqrt{3} + 6)(\sqrt{3} - 2) &= \sqrt{3}(\sqrt{3} - 2) + 6(\sqrt{3} - 2) \\ &= 3 - 2\sqrt{3} + 6\sqrt{3} - 12 \\ &= -9 + 4\sqrt{3} \end{aligned}$$

**7. Answer (C)**

The difference between the first two numbers is  $4(6 - 2)$ ; the difference between the second and third numbers is 6 ( $12 - 6$ ) which is two more than the first difference; the difference between the third and fourth numbers is 8 ( $20 - 12$ ) which is two more than the second difference; the difference between the fourth and fifth numbers is 10 ( $x - 20$ ). Thus, the value of  $x$  is given by  $x - 20 = 10$ . Solving for  $x$  yields  $x = 30$ . So, the correct answer choice is (C).

**8. Answer: (B)**

$$\frac{1}{1+\frac{1}{1+\frac{1}{4}}} = \frac{1}{1+\frac{1}{5/4}} = \frac{1}{1+\frac{4}{5}} = \frac{5}{5+4} = \frac{5}{9}$$

**9. Answer: (B)**

Note that  $\frac{1}{2} = \frac{.1 \times 10}{2 \times 10} = \frac{1}{20}$  for the response (B)

**For choice (A),**  $\frac{1}{.2} = \frac{1 \times 10}{.2 \times 10} = \frac{10}{2} = 5$  which is larger than  $\frac{1}{20}$

**For choice (C),**  $\frac{.2}{1} = \frac{.2 \times 10}{1 \times 10} = \frac{2}{10} = \frac{1}{5}$  which is larger than  $\frac{1}{20}$

**For choice (D),**  $\frac{.2}{.1} = \frac{.2 \times 10}{.1 \times 10} = \frac{2}{1} = 2$  which is larger than  $\frac{1}{20}$

For choice (E),  $\frac{2}{.1} = \frac{2 \times 10}{.1 \times 10} = \frac{20}{1} = 20$  which is larger than  $\frac{1}{20}$

### 10. Answer (B)

Let the numbers be  $4x$ ,  $5x$  and  $6x$ .  
Then, their average is  $(4x + 5x + 6x) / 3 = 25$   
 $\Rightarrow 5x = 25$   
 $\Rightarrow x = 5$ .  
Largest number,  $6x = 30$ .

### 11. Answer (E)

$$\begin{aligned} 10^3 + 10^5 &= 10^3 \cdot 1 + 10^3 \cdot 10^2 \\ &= 10^3 (1 + 10^2) \\ &= 10^3 (101) \\ &= 1,000 \cdot 101 \\ &= 101,000 \end{aligned}$$

or  $10^3 = 1,000$  and  $10^5 = 100,000$   
and thus  $10^3 + 10^5 = 101,000$

### 12. Answer (B)

**What is a standard numeral?**

A number written such that each digit has a place value according to its position in relation to other digits. Example: Write the number seven thousand, three hundred, sixty-four as a **standard numeral** and in expanded form.

$$\begin{aligned} 2^{31} \cdot 5^{27} &= 2^4 \cdot 2^{27} \cdot 5^{27} \\ &= 2^4 (2 \cdot 5)^{27} \\ &= 2^4 \cdot 10^{27} \end{aligned}$$

Since  $2^4 = 16$ , the standard numeral for  $2^4 \cdot 10^{27}$  is 16 followed by 27 zeros.  
Hence  $2^{31} \cdot 5^{27}$  has 29 digits.

### 13. Answer (D)

Using the distributive property,

$$\begin{aligned} &475,826 \cdot 521,653 + 524,174 \cdot 521,653 \\ &= (475,826 + 524,174) \cdot 521,653 \\ &= 1,000,000 (521,653) \\ &= 521,653,000,000 \end{aligned}$$

### 14. Answer (B)

Sum of digits =  $(5 + 1 + 7 + x + 3 + 2 + 4) = (22 + x)$ , which must be divisible by 3.  
Therefore,  $x = 2$ .

### 15. Answer (E)

The decimal representation of  $1/7$  is  
0.1428571428571429.....,

and the digit in the 6<sup>th</sup>, 12<sup>th</sup>, 18<sup>th</sup>, .....60<sup>th</sup> place is 7

**16. Answer (B)**

Since  $7^9$  and  $11^{25}$  are both odd numbers, their sum is even. Thus, 2 is a divisor of  $7^9 + 11^{25}$ . Also 2 is the smallest (least) prime.

**17. Answer (A)**

Remember the order of operation rules are PEMDAS, meaning parentheses, exponents, multiplication, division, addition, and subtraction. The correct solution is

$$\begin{aligned} 10 - 5[8 + 9 - 2(-2)] \\ = 10 - 5(21) \\ = 10 - 105 \\ = -95 \end{aligned}$$

**18. Answer (E)**

If X is the number, then  $0.15X = 60$ . Therefore,

$$X = \frac{60}{0.15} = 400$$

**19. Answer (E)**

Since  $\frac{1}{5} = \frac{2}{10}$ ,

$\frac{2}{9}$  is larger than  $\frac{1}{5}$  and  $\frac{2}{11}$ .

Also  $\frac{4}{17}$  is larger than  $\frac{4}{19}$ .

Now  $\frac{2}{9} = \frac{4}{18}$

Finally,  $\frac{4}{17}$  is larger than  $\frac{4}{18}$  and  $\frac{4}{19}$

**20. Answer (C)**

The arithmetic mean of scores is

$$(10 + 20 + 30 + 35 + 55)/5 = 150/5 = 30$$

Since only two scores, namely, 35 and 55 are larger than 30, the answer is (C).

**21. Answer (E)**

$$(1 - \sqrt{3})(1 + \sqrt{3}) = 1 - 3 = -2$$

$$\text{And } 2^{-2} = \frac{1}{2^2} = \frac{1}{4}$$

**22. Answer (E)**

$$\frac{2^{100} + 2^{98}}{2^{100} - 2^{98}} = \frac{2^{98}(2^2 + 1)}{2^{98}(2^2 - 1)}$$

$$= \frac{2^2 + 1}{2^2 - 1} = \frac{5}{3}$$

**23. Answer (E)**

Notice the product below. Starting from the left, it is obvious that 2 and 3 are needed as factors. For the product to be a multiple of 4, two 2 factors are needed and that is the reason for the second 2 factor. Obviously, a factor of 5 is needed; but since 2 and 3 are

already listed, the product is already a multiple of 6. A factor of 7 is needed, but only few factors of 2 and 3 are required to make the product a multiple of 8 and 9. Since 2 and 5 are already listed as factors, the product is already a multiple of 10.

$$2 \cdot 3 \cdot 2 \cdot 5 \cdot 7 \cdot 2 \cdot 3 = 2,520$$

**24. Answer (C)**

Since  $AB = BC$ , angle C has measure  $46^\circ$ . However, the sum of the measures of the angles of a triangle is  $180^\circ$  and  $180 - (46 + 46) = 88$  so the measure of angle B is  $88^\circ$ .

**25. Answer (B)**

The last digit in the successive powers of 3 repeat at intervals of 4:

$$3^1 = 3, 3^5 = 243$$

$$3^2 = 9, 3^6 = 729$$

$$3^3 = 27, 3^7 = 2,187$$

$$3^4 = 81, 3^8 = 6,561$$

The pattern is 3, 9, 7, 1, 3, 9, 7, 1, ..... and since  $2000 = 4(500)$ ,  $3^{2000}$  has a last digit of 1.

Choice (A) comes from  $3(2000) = 6000$ .

Choices (C), (D), and (E) which are 3, 7, 9 respectively are the other ending digits in the power of 3.

**26. Answer (E)**

For a 4 – digit number, there are  $9 \cdot 10 \cdot 10 \cdot 10$  possibilities because 0 may not be used for the thousands place but if the digit 5 is not allowed, then there are

$$8 \cdot 9 \cdot 9 \cdot 9 = 5,832 \text{ possibilities.}$$

So, answer is E.

**27. Answer (B)**

$$a \div c + b \div c = (a + b) \div c$$

Thus

$$\begin{aligned} 15,561 \div 25 + 9,439 \div 25 &= (15,561 + (9,439)) \div 25 \\ &= 25,000 \div 25 \\ &= 1,000 \end{aligned}$$

**28. Answer (A)**

When  $n$  is odd, the units digit for  $4^n$  is 4, and when  $n$  is even, the units digit for  $4^n$  is 6.

**29. Answer (A)**

The first two-digit no. Divisible by 6 is 12 and the last no. Divisible by 6 till 90 is 90

The sequence is 12, 18, 24, 30,....., 90. Which is an arithmetic progression.

Therefore,  $a = 12$ ,  $d = 6$  and last term = 90

We know,

$$\text{last term} = a + (n-1) d$$

$$90 = 12 + (n-1) 6$$

$$n = 14$$

**30. Answer: (E)**

$$1 + 2 + 3 + 4 + \dots + 49 + 50 + 51 + \dots + 97 + 98 + 99 = 49 \cdot 100 + 50 = 4950$$

**Alternatively:**

$1+2+3+\dots+n = n*(n+1)/2.$   
 So,  $1+2+3+\dots+99 = 99*100/2 = 9900/2 = 4950.$

**31. Answer (A)**

Let  $.24\overline{24} = X$ . Then,  
 $100X = 100(.24\overline{24}) = 24.\overline{24} = 24.24\overline{24}$   
 It follows that  
 $100X - X = 24.\overline{24} - .24\overline{24} = 24,$   
 so that  $X = 24/99 = 8/33$

**32. Answer (E)**

$$\frac{2^{-4}+2^{-1}}{2^{-3}} = \frac{\frac{1}{2^4}+\frac{1}{2}}{\frac{1}{2^3}} = \frac{2^4(\frac{1}{2^4}+\frac{1}{2})}{2^4 \cdot \frac{1}{2^3}} = \frac{1+2^3}{2} = \frac{9}{2}$$

**33. Answer (C)**

First find the **least common multiple (LCM) of 3, 4, and 5**, which is simply  
 $3 \times 4 \times 5 = 60$

Since 3 divides 60, 4 divides 60, and 5 divides 60, then one needs only to add 2 to 60 in order to guarantee that the remainder in each case will be 2 when 3, 4 and 5, respectively are divided into 62.

**Alternatively:**

- Looking at the options,  
 A. 22 leaves a remainder of 1 when divided by 3. So, incorrect.  
 B. 42 leaves a remainder of 0 when divided by 3. So, incorrect.  
 C. 62 leaves a remainder of 2 when divided by either of 3, 4 or 5. And it is the smallest among 122, and 182. So, it has to be correct.

**34. Answer (C)**

First, observe that three eighths is  $3/8$  and one tenth is  $1/10$ . Let  $x$  be the unknown part which must be found. Then, one can write from the statement of the problem that  $x$  part of three eighths is given by:

$$\frac{3}{8}x$$

The equation for the problem is given by

$$\frac{3}{8}x = \frac{1}{10}$$



Multiplying both sides of the equation by the reciprocal of  $\frac{3}{8}$  one obtains the following:

$$\frac{8}{3} \cdot \frac{3}{8} x = \frac{8}{3} \cdot \frac{1}{10} \text{ or } x = \frac{8}{30} \text{ or } x = \frac{4}{15}$$

which is choice (C)

**35. Answer (B)**

A common denominator is needed to add fractions. The least common denominator in the problem is 9 since the smallest number that both 3 and 9 will divide into is 9. If the denominator of  $\frac{2}{3}$  is multiplied by 3 then the numerator must also be multiplied by 3. Thus

$$(2 \times 3) / (3 \times 3) = \frac{6}{9}$$

Adding the numerators and using the common denominator,

$$(\frac{6}{9}) + (\frac{5}{9}) = (\frac{6 + 5}{9}) = (\frac{11}{9})$$

**36. Answer (B)**

To add fractions with a common denominator, add the numerators,

$$3 + 2 = 5$$

Write the sum over the common denominator. The correct answer is  $\frac{5}{6}$ .

**37. Answer (C)**

Prime Number is the number which has only 2 factors i.e. one and number itself. 81 is divisible by 9. So, it is not a prime number.

**38. Answer (A)**

To change percent to decimal, drop the percent sign and move the decimal point two place values to the left. The correct answer is 1.25937

**39. Answer (C)**

Units of measurement must be the same to create a ratio. Multiply  $8 * 12$  to find the number of inches in 8 feet which is 96. The ratio of 96 to 28 is  $\frac{96}{28}$ . Find a common factor of 96 and 28, which is 4. Divide 96 by 4, which is 24, and 28 by 4, which is 7. The correct answer is  $\frac{24}{7}$ .

**40. Answer (D)**

Prime Number is a positive number which has only 2 positive factors i.e. one and number itself.

97 clearly only have two positive factors 1 and 97. So, it is prime.

Also observe that all other numbers are multiples of 3. Hence, they are composite not prime numbers.

**41. Answer (C)**

To change a mixed number to an improper fraction, multiply the whole number (4) by the denominator (6) of the fraction (4 times 6 is 24). Add the numerator (5) to the product (24). Write the sum (29) over the denominator of the fraction,  $\frac{29}{6}$ .

**42. Answer (A)**

If the smallest number is X, then

$$X + (X + 1) + (X + 2) + (X + 3) = 226$$

giving  $4X + 6 = 226$

Therefore

$$4X = 220, \text{ or } X = 55$$

**43. Answer (B)**

$$\begin{aligned} 4\% \cdot 4\% &= 0.04 \cdot 0.04 \\ &= 0.0016 \\ &= 0.16\% \end{aligned}$$

**44. Answer (A)**

$$\text{Let } x - 53651 = 9999$$

$$\text{Then, } x = 9999 + 53651 = 63650$$

**45. Answer (E)**

Prime numbers less than 50 are:

2, 3, 5, 7, 11, 13, 17, 19, 23, 29, 31, 37, 41, 43, 47

So, 15 in total.

**46. Answer (C)**

$$2^{50} \cdot 5^{51}$$

$2^{50}$  is a multiple of 2.  $5^{51}$  is a multiple of 5. So,  $2^{50} \cdot 5^{51}$  is a multiple of 10. Any multiple of 10 must always end in a 0. So, units place = 0.

**47. Answer (D)**

$$7/8 = 0.875.$$

**48. Answer (C)**

Certainly, the easiest and the most direct way to solve this problem is to perform the indicated operations.

Performing the indicated operations yield,

$$\begin{aligned} \sqrt{75} - 3\sqrt{48} + \sqrt{147} &= \sqrt{(25)(3)} - \sqrt{(16)(3)} + \sqrt{(49)(3)} \\ &= 5\sqrt{3} - 3(4)\sqrt{3} + 7\sqrt{3} \\ &= 5\sqrt{3} - 12\sqrt{3} + 7\sqrt{3} \\ &= (5 - 12 + 7) \sqrt{3} \end{aligned}$$

$$= (12 - 12) \sqrt{3}$$

$$= 0 \cdot \sqrt{3} = 0$$

**49. Answer (C)**

The numbers are 5, 15, 25, 35, 45, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 65, 75, 85, 95.  
So, 19 such numbers.

**50. Answer (A)**

Since 40 seconds is  $\frac{2}{3}$  minute and  $\frac{1}{6}$  hour is ten minutes, the ratio is

$$\frac{2}{3} : 1.5 : 10$$

Multiplying by 6 yields

$$6\left(\frac{2}{3}\right) : 6\left(\frac{3}{2}\right) : 6(10) \text{ or } 4 : 9 : 60$$

**Alternatively:**

Convert everything to seconds.

$$40 \text{ sec} = 40 \text{ sec.}$$

$$1 \frac{1}{2} \text{ mins} = 90 \text{ sec.}$$

$$\frac{1}{6} \text{ hr} = \frac{1}{6} * 60 \text{ min} = 10 \text{ min} = 10 * 60 = 600 \text{ sec.}$$

So, ratio is 40:90:600 = 4:9:60.