CHAPTER

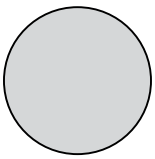
3

Fractions

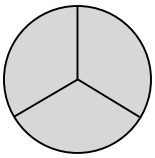
Learning objectives

3.1 FRACTION

When a thing is divided into equal parts, then each part is called a fraction of the whole.



→ Whole (1)



→ Divided whole into 3 equal parts

→ Each part is $\frac{1}{3}$ of the whole

Here $1 \div 3 = \frac{1 \rightarrow \text{Numerator}}{3 \rightarrow \text{Denominator}}$

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- A fraction always means numerator is divided by denominator.
- The denominator of a fraction tells us the total number of equal parts into which the figure is divided.
- The numerator of a fraction tells us the number of parts chosen.

Proper Fractions

A fraction in which numerator is less than the denominator is called proper fraction.

For example : $\frac{4}{7}$ is a proper fraction.

Improper Fractions

A fraction in which numerator is more than the denominator is called improper fraction.

For example : $\frac{7}{4}$ is an improper fraction.

Like Fractions

Fractions having same denominators are called like fractions.

For example : $\frac{3}{11}$ and $\frac{4}{11}$ are like fractions.

Unlike Fractions

Fractions having different denominators are called unlike fractions. (It doesn't matter what the numerator is)

For example : $\frac{4}{9}$ and $\frac{5}{13}$ are unlike fractions.

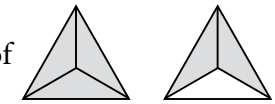
Unit Fractions

A fraction with numerator as 1 is called unit fraction.

For example : $\frac{1}{5}$ and $\frac{1}{7}$ are unit fractions.

Mixed Fractions

Mixed fraction is a combination of a whole number and a proper fraction.

For example : Fraction of shaded part of  is $\frac{3}{3}+\frac{2}{3}=1+\frac{2}{3}=1\frac{2}{3}$ is a mixed fraction.

3.2 CONVERSION OF FRACTIONS

Conversion of Mixed Fractions into Improper Fractions

Convert $3\frac{4}{7}$ into improper fraction.

- Multiply the whole part by denominator, *i.e.*, $3 \times 7 = 21$
- Add numerator to the result of previous step, *i.e.*, $21 + 4 = 25$
- The sum obtained will be the numerator for the required improper fraction, whereas denominator remains same.

So, $3\frac{4}{7}=\frac{7\times3+4}{7}=\frac{25}{7}$

Conversion of Improper Fractions into Mixed Fractions

Convert $\frac{13}{5}$ into mixed fraction.

- Divide the numerator by the denominator, *i.e.*, divide 13 by 5, by long-division method.

$$
\begin{array}{r}
\,2 \\
5\overline{)\,1\;3} \\
-\,1\;0 \\
\hline
\,3
\end{array}
$$

Quotient

Remainder

- Write down the whole number (Quotient) result.
- Use the remainder as the new numerator over the denominator. This is the fraction part of the mixed fraction.

So, $\frac{13}{5}=2\frac{3}{5}$

SELF TEST - 1

1. $4\frac{3}{8}$ is same as _____.

(A) $\frac{35}{8}$ (B) $\frac{32}{8}$

(C) $\frac{35}{3}$ (D) $\frac{32}{3}$

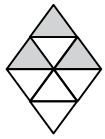
2. Which of the following will come in place of (?)?

$$\frac{41}{9} = 4\frac{\boxed{?}}{9}$$

(A) 2 (B) 4

(C) 5 (D) 1

3. What fraction of the given figure is unshaded?



(A) $\frac{5}{8}$ (B) $\frac{3}{8}$

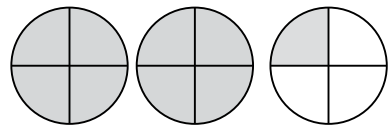
(C) $\frac{3}{7}$ (D) $\frac{4}{7}$

4. Which of the following is a unit fraction?

(A) $\frac{5}{7}$ (B) $\frac{1}{8}$

(C) $\frac{3}{4}$ (D) $\frac{2}{5}$

5. The given figure shows _____ as shaded fraction.

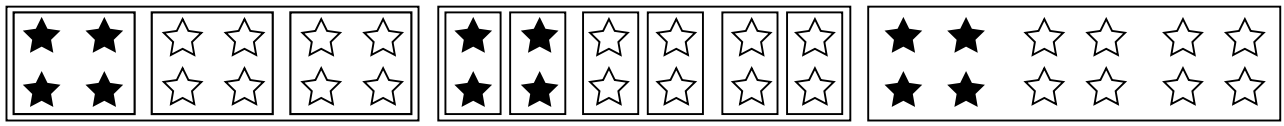


(A) $2\frac{1}{2}$ (B) $2\frac{3}{4}$

(C) $1\frac{3}{4}$ (D) $2\frac{1}{4}$

3.3 EQUIVALENT FRACTIONS

In the following collections, $\frac{1}{3}$ (one-third) of each collection is shaded. The fraction represented by shaded portion of each collection is given below the figure.



$\frac{1}{3}$ $\frac{2}{6}$ $\frac{4}{12}$

The shaded portion of the figures are equal. So, the fractions which indicate the shaded portions should also be equal, *i.e.*, $\frac{1}{3} = \frac{2}{6} = \frac{4}{12}$ and so on.

These fractions are called equivalent (equal) fractions.

To find a fraction equivalent to a given fraction

- To get a fraction equivalent to a given fraction, we multiply or divide the numerator and the denominator of the given fraction by the same non-zero number.

  For example : Find two equivalent fractions of $\frac{6}{9}$.

  $\frac{6\times2}{9\times2} = \frac{12}{18}$ and $\frac{6\div3}{9\div3} = \frac{2}{3}$

So, $\frac{12}{18}$ and $\frac{2}{3}$ are equivalent fractions of $\frac{6}{9}$.

3.4 REDUCING FRACTIONS IN ITS SIMPLEST FORM

- A fraction is said to be in its lowest/simplest form, if HCF of its numerator and denominator is 1.
- To convert a fraction into simplest form, divide the numerator and denominator by their HCF.

For example : Reduce $\frac{20}{25}$ to its lowest form.

Factors of 20 are (1), 2, 4, (5), 10 and 20.

Factors of 25 are (1), (5) and 25.

Common factors are 1, 5. So, HCF is 5.

$\therefore$ Divide numerator and denominator of the given fraction by 5 *i.e.*, $\frac{20 \div 5}{25 \div 5} = \frac{4}{5}$.

Hence, $\frac{4}{5}$ is the simplest form of $\frac{20}{25}$.

3.5 ADDITION AND SUBTRACTION OF LIKE FRACTIONS

Addition of Like Fractions

$$\text{Addition of like fractions} = \frac{\text{Sum of numerators}}{\text{Common denominator}}$$

For example : $\frac{1}{5}+\frac{2}{5}=\frac{1+2}{5}=\frac{3}{5}$

Subtraction of Like Fractions

$$\text{Subtraction of like fractions} = \frac{\text{Difference of numerators}}{\text{Common denominator}}$$

For example : $\frac{6}{11}-\frac{2}{11}=\frac{6-2}{11}=\frac{4}{11}$

3.6 ADDITION AND SUBTRACTION OF UNLIKE FRACTIONS

Addition of Unlike Fractions

- To add unlike fractions convert them into equivalent fractions with same denominator and then add.

For example : Add $\frac{1}{4}$ and $\frac{2}{3}$.

- Convert fractions into equivalent fractions

  $\frac{1\times3}{4\times3}=\frac{3}{12}$ and $\frac{2\times4}{3\times4}=\frac{8}{12}$

- Add the equivalent fractions

  $\frac{3}{12}+\frac{8}{12}=\frac{3+8}{12}=\frac{11}{12}$

So, $\frac{1}{4}+\frac{2}{3}=\frac{11}{12}$

Subtraction of Unlike Fractions

- To subtract unlike fractions convert them into equivalent fractions with same denominator and subtract.

For example : $\frac{5}{9}-\frac{1}{6}$

- Convert fractions into equivalent fractions

  $\frac{5\times2}{9\times2}=\frac{10}{18}$ and $\frac{1\times3}{6\times3}=\frac{3}{18}$

- Subtract these equivalent fractions

  $\frac{10}{18}-\frac{3}{18}=\frac{10-3}{18}=\frac{7}{18}$

  So, $\frac{5}{9}-\frac{1}{6}=\frac{7}{18}$

3.7 COMPARISON OF FRACTIONS

Comparison of Like Fractions

If the denominators of given fractions are same, then the fraction with greater numerator is greater.

For example : $\frac{5}{8}>\frac{2}{8}$ and $\frac{1}{7}<\frac{3}{7}$

Comparison of Unlike Fractions

- If the numerators of two given unlike fractions are same, then the fraction with greater denominator is smaller than the fraction with smaller denominator.

  For example : $\frac{3}{8}>\frac{3}{11}$ and $\frac{1}{6}<\frac{1}{5}$

- If the numerators of two given unlike fractions is different, then we convert the fractions into equivalent fractions of same denominator and then compare.

  For example : Compare $\frac{2}{7}$ and $\frac{3}{5}$

LCM of 7 and 5 = 35

Equivalent fractions of $\frac{2}{7}$ and $\frac{3}{5}$ with the denominator 35 are $\frac{10}{35}\left(i.e., \frac{2\times5}{7\times5}\right)$ and $\frac{21}{35}\left(i.e., \frac{3\times7}{5\times7}\right)$ respectively.

Thus, $\frac{10}{35}<\frac{21}{35}$ or $\frac{2}{7}<\frac{3}{5}$

3.8 FRACTION OF A NUMBER

Let's learn how to find the fraction of a collection or a number with the help of an example.

For example : Find $\frac{3}{5}$ of 25 candies.

$\frac{3}{5}$ is same as 3 parts out of 5 equal parts.

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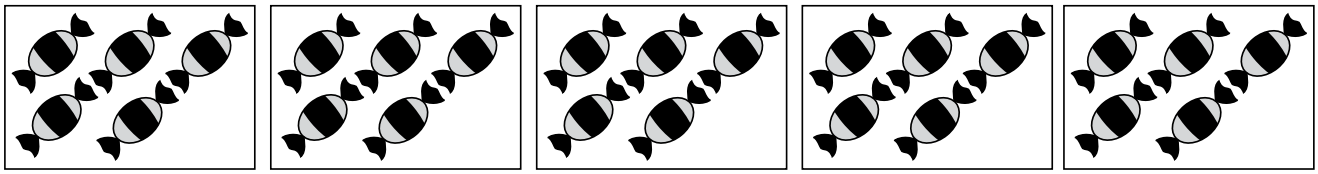
$\frac{4}{5}$ of 15 is same as $\frac{4}{5}\times15=12$

Distribute 25 candies into 5 equal parts.



Now 3 equal parts will have

3×5 candies = 15 candies.

$\therefore$ $\frac{3}{5}$ of 25 candies = 15

SELF TEST - 2

1. Which of the following is not equivalent to $\frac{4}{5}$?

(A) $\frac{8}{10}$ (B) $\frac{24}{30}$

(C) $\frac{20}{25}$ (D) $\frac{12}{20}$

2. By how much is $\frac{14}{15}$ greater than $\frac{7}{15}$?

(A) $\frac{1}{5}$ (B) $\frac{1}{4}$

(C) $\frac{7}{15}$ (D) $\frac{3}{5}$

3. Solve : $\frac{1}{5}$ of $125 + \frac{1}{3}$ of 81

(A) 42 (B) $\frac{7}{5}$

(C) 52 (D) $\frac{4}{3}$

4. The simplest form of $\frac{30}{36}$ is _____.

(A) $\frac{5}{7}$ (B) $\frac{5}{6}$

(C) $\frac{3}{5}$ (D) $\frac{4}{7}$

5. Compare and fill in the box.

$\frac{5}{8} + \frac{3}{8} \square \frac{1}{4} + \frac{3}{4}$

(A) <

(B) =

(C) >

(D) Can't be determined

EXERCISE

1. Find the value of $3\frac{4}{5}+4\frac{3}{5}-1\frac{1}{5}$.

(A) $3\frac{1}{5}$ (B) $2\frac{1}{5}$

(C) $7\frac{1}{5}$ (D) $4\frac{1}{5}$

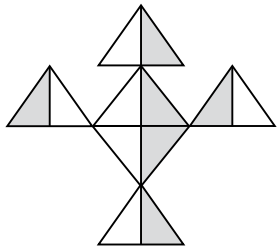
2. Arrange the following in descending order.

$$\frac{9}{27},\frac{1}{2},\frac{5}{25},\frac{4}{24},\frac{10}{15}$$

(A) $\frac{10}{15},\frac{9}{27},\frac{5}{25},\frac{4}{24},\frac{1}{2}$ (B) $\frac{4}{24},\frac{5}{25},\frac{9}{27},\frac{1}{2},\frac{10}{15}$

(C) $\frac{10}{15},\frac{1}{2},\frac{9}{27},\frac{5}{25},\frac{4}{24}$ (D) $\frac{4}{24},\frac{1}{2},\frac{10}{15},\frac{5}{25},\frac{9}{27}$

3. What fraction of the given figure is shaded?



(A) $\frac{3}{4}$ (B) $\frac{1}{2}$

(C) $\frac{1}{4}$ (D) $\frac{1}{3}$

4. Which one of the following fractions is $\frac{2}{15}$ less than $\frac{4}{5}$?

(A) $\frac{6}{5}$ (B) $\frac{2}{3}$

(C) $\frac{1}{4}$ (D) $\frac{3}{5}$

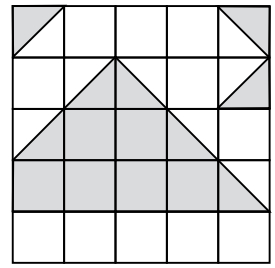
5. Compare and fill in the box.

$$\frac{5}{8}+\frac{3}{4}\square\frac{5}{8}-\frac{1}{4}$$

(A) < (B) >

(C) = (D) Can't be determined

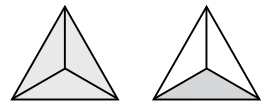
6. What fraction of the given figure is shaded?



(A) $\frac{17}{25}$ (B) $\frac{5}{17}$

(C) $\frac{2}{5}$ (D) $\frac{10}{21}$

7. Which of the following fractions represents the shaded part of the given figures?



(A) $1\frac{1}{4}$ (B) $1\frac{1}{3}$

(C) $\frac{2}{3}$ (D) $\frac{3}{4}$

8. Which of the following is an improper fraction?

(A) $\frac{5}{12}$ (B) $\frac{1}{9}$

(C) $\frac{3}{4}$ (D) $\frac{7}{6}$

9. A florist has 12 roses. 2 of them are white, 3 of them are yellow and rest are red. What fraction of the roses are red?

(A) $\frac{5}{12}$ (B) $\frac{7}{12}$

(C) $\frac{5}{7}$ (D) $\frac{7}{9}$

10. How many one-sixth makes one whole?

(A) 4 (B) 6

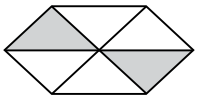
(C) 10 (D) 12

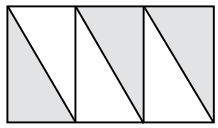
11. Sohan filled one-fifth of a beaker with milk and two-fifth with water. What part of the beaker is empty?

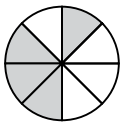
(A) 1/2 (B) 1/5

(C) 3/5 (D) 2/5

12. Which of the following figure shows $\frac{1}{3}$ part shaded?

(A) 

(B) 

(C) 

(D) None of these

13. If $a - \frac{11}{18} = \frac{5}{18}$, then a = _____.

(A) $\frac{13}{18}$ (B) $\frac{4}{5}$

(C) $\frac{8}{9}$ (D) $\frac{7}{18}$

14. Kavya bought 20 bulbs out of which 8 are good. What fraction of the bulbs is not good?

(A) $\frac{2}{5}$ (B) $\frac{3}{5}$

(C) $\frac{2}{3}$ (D) $\frac{3}{4}$

15. Which of the following figures has same fraction of unshaded part as the fraction of shaded part of the Fig. (X)?

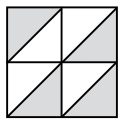
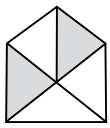
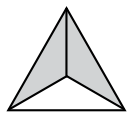
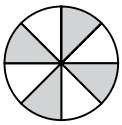
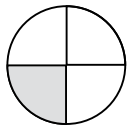


Fig. (X)

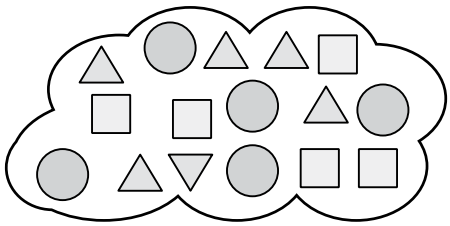
(A) 

(B) 

(C) 

(D) 

16. What fraction of the given shapes is circle in the given cloud?



(A) $\frac{5}{16}$ (B) $\frac{11}{16}$

(C) $\frac{8}{16}$ (D) $\frac{3}{16}$

17. The total number of children in a class is 40. If the fraction of the class that was present on Monday is $\frac{31}{40}$, then how many children were absent on that day?

(A) 31 (B) 18

(C) 21 (D) 9

18. Aman went on a 15 days trip. He spent 7 days in Manali and rest of the days in Shimla. What fraction of his trip did he spend in Shimla?

(A) $\frac{8}{7}$ (B) $\frac{7}{8}$

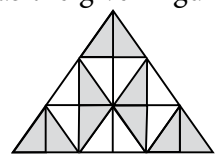
(C) $\frac{8}{15}$ (D) $\frac{7}{15}$

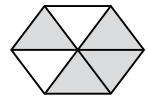
19. Which of the following is INCORRECT?

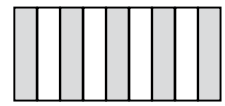
(A) $\frac{19}{4} = 4\frac{3}{4}$ (B) $\frac{27}{2} = 13\frac{1}{2}$

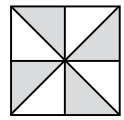
(C) $\frac{35}{3} = 11\frac{1}{3}$ (D) $\frac{25}{4} = 6\frac{1}{4}$

20. Which of the following figures has the same shaded fraction as the given figure?



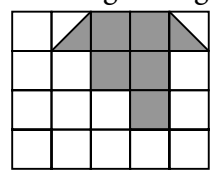
(A) 

(B) 

(C) 

(D) None of these

21. What fraction of the given figure is not shaded?



(A) $\frac{3}{10}$ (B) $\frac{7}{10}$

(C) $\frac{11}{20}$ (D) $\frac{13}{20}$

22. The value of $\frac{4}{27} + \frac{10}{9} + \frac{32}{27}$ is _____.

(A) $1\frac{11}{27}$ (B) $2\frac{4}{9}$

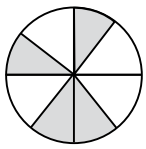
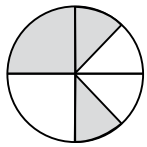
(C) $1\frac{8}{27}$ (D) $2\frac{7}{9}$

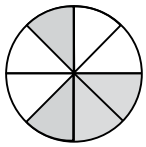
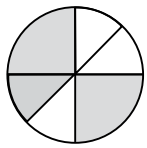
23. If $\frac{★}{5} - 1\frac{3}{10} = \frac{1}{10}$, then find the value of ★.

(A) 3 (B) 6

(C) 2 (D) 7

24. Which of the following does not have half of its figure shaded?

(A)  (B) 

(C)  (D) 

25. There were 4500 males and 2500 females in a stadium. After 2 hours, $\frac{4}{10}$ of the females left the stadium. How many persons were in the stadium after 2 hours?

(A) 6000 (B) 5000

(C) 1500 (D) 1800

26. Find the difference between $\frac{1}{4}$ of 328 and $\frac{1}{7}$ of 147.

(A) $\frac{81}{7}$ (B) 61

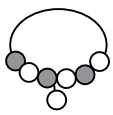
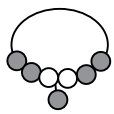
(C) 103 (D) None of these

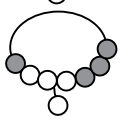
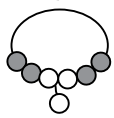
27. Pooja had 45 cupcakes. She ate 5 of them and gave 5 cupcakes to each of her 3 friends. Find the fraction of cupcakes left with her.

(A) $\frac{4}{9}$ (B) $\frac{3}{5}$

(C) $\frac{4}{7}$ (D) $\frac{5}{9}$

28. Which of the following necklaces has $\frac{4}{7}$ of the beads shaded?

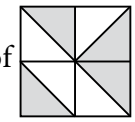
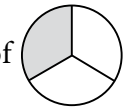
(A)  (B) 

(C)  (D) 

29. Find the missing value in $2\frac{1}{5} + 1\frac{3}{5} = 3 + \boxed{?}$.

(A) $\frac{1}{5}$ (B) $\frac{4}{5}$

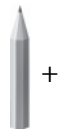
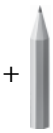
(C) $\frac{3}{5}$ (D) $\frac{2}{5}$

30. Shaded fraction of  – Shaded fraction of  is equal to _____.

(A) $\frac{2}{3}$ (B) $\frac{3}{5}$

(C) $\frac{4}{5}$ (D) $\frac{1}{6}$

Achievers Section (HOTS)

31. If  +  +  = $\frac{17}{12}$,  +  = $\frac{7}{6}$ and  –  = $\frac{5}{12}$, then what is the value of  ?

(A) $\frac{1}{4}$ (B) $\frac{2}{3}$

(C) $\frac{5}{3}$ (D) $\frac{3}{4}$

32. Match the following and select the correct option.

Column A	Column B
(p) $\frac{4}{3} + \frac{3}{9}$	(i) $1\frac{2}{5}$
(q) $\frac{8}{5} - \frac{3}{15}$	(ii) $1\frac{7}{13}$
(r) $\frac{7}{9} - \frac{1}{5}$	(iii) $1\frac{2}{3}$
(s) $\frac{12}{13} + \frac{8}{13}$	(iv) $\frac{26}{45}$

(A) (p) → (ii); (q) → (i); (r) → (iv); (s) → (iii)

(B) (p) → (iii); (q) → (i); (r) → (iv); (s) → (ii)

(C) (p) → (iv); (q) → (i); (r) → (ii); (s) → (iii)

(D) (p) → (iii); (q) → (ii); (r) → (i); (s) → (iv)

33. Which of the following statements is/are true?

(i) Two fractions are said to be equivalent, if they have the same denominators.

(ii) $\frac{4}{5}$ and $\frac{20}{25}$ are equivalent fractions.

(A) Only (i) (B) Only (ii)

(C) Both (i) and (ii) (D) Neither (i) nor (ii)

34. Which of the following option is INCORRECT?

(A) $\frac{1}{7}$ is unit as well as a proper fraction.

(B) $\frac{19}{11}$ is an improper fraction.

(C) $\frac{4}{7}$ and $\frac{5}{7}$ are unlike fractions.

(D) $5\frac{2}{3}$ is a mixed fraction.

35. $\frac{1}{7}$ of the class IV students choose to join swimming. $\frac{1}{3}$ of the remaining students choose to join running. If there were total 126 students, then how many

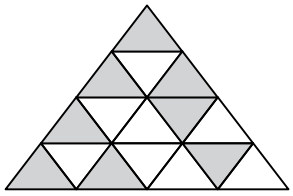
(a) students choose to join swimming?

(b) more students choose to join running than swimming?

	(a)	**(b)**
(A)	16	18
(B)	16	48
(C)	18	42
(D)	18	18

SOF IMO 2019 QUESTIONS

1. How many shaded triangles must be unshaded so that $\frac{1}{4}$ of the given figure is shaded?



(A) 1 (B) 2

(C) 3 (D) 4 *(Level-1)*

2. Mohit has some animal cards as shown. What fraction of the cards are cat cards?

Cat	Dog	Horse
Horse	Dog	Cat
Cat	Horse	Cat
Dog	Cat	Horse

(A) $\frac{1}{12}$ (B) $\frac{5}{12}$

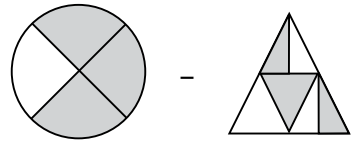
(C) $\frac{6}{12}$ (D) $\frac{4}{9}$ *(Level-1)*

3. Aarav filled one-fifth of a jar with milk and two-fifth with water. What part of the jar is empty?

(A) $\frac{1}{5}$ (B) $\frac{2}{5}$

(C) $\frac{3}{5}$ (D) $\frac{1}{2}$ *(Level-1)*

4. Which of the following fractions represents the shaded part of the given figures?



(A) $\frac{3}{8}$ (B) $\frac{3}{4}$

(C) $\frac{5}{4}$ (D) $\frac{1}{4}$ *(Level-1)*

5. There were 320 gems in a jar. If 150 of the gems were red and the rest of the gems were white, then what fraction of the gems was white?

(A) $\frac{17}{32}$ (B) $\frac{15}{32}$

(C) $\frac{13}{32}$ (D) $\frac{19}{32}$ *(Level-1)*

6. Who among the following students has written the CORRECT statement?

Kavya : Fraction of vowels in the word EXPRESSION is $\frac{4}{5}$.

Shruti : Sum of 2 times of $\frac{15}{12}$ and 3 times of $\frac{18}{12}$ is 7.

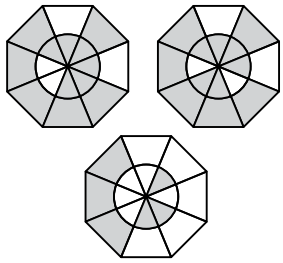
(A) Only Shruti (B) Only Kavya

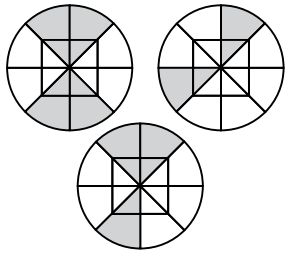
(C) Both Shruti and Kavya

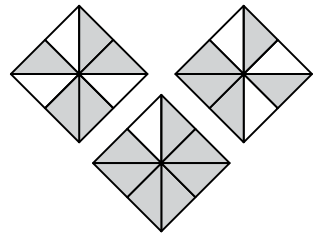
(D) Neither Shruti nor Kavya *(Level-1)*

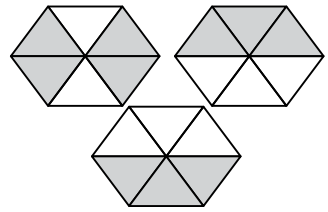
7. Match the figures given in Column I with their unshaded fractions given in Column II and select the correct option.

Column I **Column II**

(P)  (i) $\frac{4}{3}$

(Q)  (ii) $\frac{9}{8}$

(R)  (iii) $\frac{15}{8}$

(S)  (iv) $\frac{7}{8}$

(A) (P) – (ii), (Q) – (iii), (R) – (iv), (S) – (i)

(B) (P) – (iv), (Q) – (iii), (R) – (ii), (S) – (i)

(C) (P) – (ii), (Q) – (i), (R) – (iv), (S) – (iii)

(D) (P) – (i), (Q) – (ii), (R) – (iii), (S) – (iv)

(Level-2)

HINTS & EXPLANATIONS

SELF TEST - 1

1. (A): $4\frac{3}{8}=\frac{4\times8+3}{8}=\frac{35}{8}$

2. (C): $\frac{41}{9}=4\frac{\boxed{5}}{9}$

3. (A): Total number of equal parts = 8

Number of unshaded parts = 5

$\therefore$ Required fraction = $\frac{5}{8}$

4. (B)

5. (D): Required fraction = $1+1+\frac{1}{4}=2\frac{1}{4}$

SELF TEST - 2

1. (D): (A) $\frac{8}{10}=\frac{8\div2}{10\div2}=\frac{4}{5}$

(B) $\frac{24}{30}=\frac{24\div6}{30\div6}=\frac{4}{5}$

(C) $\frac{20}{25}=\frac{20\div5}{25\div5}=\frac{4}{5}$

(D) $\frac{12}{20}=\frac{12\div4}{20\div4}=\frac{3}{5}\neq\frac{4}{5}$

2. (C): $\frac{14}{15}-\frac{7}{15}=\frac{14-7}{15}=\frac{7}{15}$

3. (C): $\frac{1}{5}$ of $125+\frac{1}{3}$ of $81=25+27=52$

4. (B): $\frac{30}{36}=\frac{30\div6}{36\div6}=\frac{5}{6}$

5. (B): $\frac{5}{8}+\frac{3}{8}=\frac{5+3}{8}=\frac{8}{8}=\frac{8\div8}{8\div8}=1$

and $\frac{1}{4}+\frac{3}{4}=\frac{1+3}{4}=\frac{4}{4}=\frac{4\div4}{4\div4}=1$

So, $\frac{5}{8}+\frac{3}{8}\boxed{=}\frac{1}{4}+\frac{3}{4}$

EXERCISE

1. (C): $3\frac{4}{5}+4\frac{3}{5}-1\frac{1}{5}=\frac{19}{5}+\frac{23}{5}-\frac{6}{5}$

$=\frac{19+23-6}{5}=\frac{36}{5}=7\frac{1}{5}$

2. (C): The given fractions are

$\frac{9}{27},\frac{1}{2},\frac{5}{25},\frac{4}{24},\frac{10}{15}$ *i.e.*, $\frac{1}{3},\frac{1}{2},\frac{1}{5},\frac{1}{6},\frac{2}{3}$

LCM of 2, 3, 5 and 6 is 30.

So, $\frac{1}{3}=\frac{1\times10}{3\times10}=\frac{10}{30};\frac{1}{2}=\frac{1\times15}{2\times15}=\frac{15}{30};$

$\frac{1}{5}=\frac{1\times6}{5\times6}=\frac{6}{30};\frac{1}{6}=\frac{1\times5}{6\times5}=\frac{5}{30};$

$\frac{2}{3}=\frac{2\times10}{3\times10}=\frac{20}{30}$

Clearly, 20 > 15 > 10 > 6 > 5

i.e., $\frac{20}{30}>\frac{15}{30}>\frac{10}{30}>\frac{6}{30}>\frac{5}{30}$

$\Rightarrow\frac{2}{3}>\frac{1}{2}>\frac{1}{3}>\frac{1}{5}>\frac{1}{6}$

So, the correct descending order is

$\frac{10}{15},\frac{1}{2},\frac{9}{27},\frac{5}{25},\frac{4}{24}$

3. (B): Total number of equal parts = 12

Number of shaded parts = 6

$\therefore$ Shaded fraction = $\frac{6}{12}$

HCF of 6 and 12 = 6

Hence, the simplest form of $\frac{6}{12}=\frac{6\div6}{12\div6}=\frac{1}{2}$

4. (B): Required fraction $=\frac{4}{5}-\frac{2}{15}$

LCM of 5 and 15 = 15

So, $\frac{4}{5}-\frac{2}{15}=\frac{4\times3}{5\times3}-\frac{2\times1}{15\times1}=\frac{12}{15}-\frac{2}{15}$

$=\frac{12-2}{15}=\frac{10}{15}=\frac{2}{3}$

5. (B): L.C.M of 4 and 8 = 8

So, $\frac{3}{4}=\frac{3\times2}{4\times2}=\frac{6}{8}$

Thus, $\frac{5}{8}+\frac{3}{4}=\frac{5}{8}+\frac{6}{8}=\frac{5+6}{8}=\frac{11}{8}$

Also, $\frac{1}{4}=\frac{1\times2}{4\times2}=\frac{2}{8}$

Thus, $\frac{5}{8}-\frac{1}{4}=\frac{5}{8}-\frac{2}{8}=\frac{5-2}{8}=\frac{3}{8}$

So, $\frac{11}{8}\boxed{>}\frac{3}{8}$

6. (C): Total number of equal parts = 50
Number of shaded parts = 20

$\therefore$ Shaded fraction = $\frac{20}{50}$

HCF of 20 and 50 = 10

Hence, simplest form of $\frac{20}{50}=\frac{20\div10}{50\div10}=\frac{2}{5}$

7. (B): Required shaded fraction = $1+\frac{1}{3}=1\frac{1}{3}$

8. (D)

9. (B): Total number of roses = 12
Number of white roses = 2
Number of yellow roses = 3
So, number of red roses = 12 – 2 – 3 = 7

So, fraction of roses that are red = $\frac{7}{12}$

10. (B): $\frac{1}{6}\times6=1$

So, 6 one-sixths will make one whole.

11. (D): Fraction of beaker filled with milk = $\frac{1}{5}$

Fraction of beaker filled with water = $\frac{2}{5}$

Total fraction of beaker which is filled = $\frac{1}{5}+\frac{2}{5}=\frac{3}{5}$

So, fraction of beaker which is empty = $1-\frac{3}{5}$

$=\frac{5}{5}-\frac{3}{5}=\frac{2}{5}$

12. (A): (A) Total number of equal parts = 6
Number of shaded parts = 2

So, shaded fraction = $\frac{2}{6}=\frac{1}{3}$

(B) Total number of equal parts = 6
Number of shaded parts = 3

So, shaded fraction = $\frac{3}{6}=\frac{1}{2}$

(C) Total number of equal parts = 8
Number of shaded parts = 4

So, shaded fraction = $\frac{4}{8}=\frac{1}{2}$

13. (C): We have, $a-\frac{11}{18}=\frac{5}{18}$

$\Rightarrow a=\frac{5}{18}+\frac{11}{18}=\frac{16}{18}=\frac{16\div2}{18\div2}=\frac{8}{9}$

14. (B): Total number of bulbs bought = 20
Number of good bulbs = 8
So, number of bulbs that are not good = 20 – 8 = 12

So, required fraction = $\frac{12}{20}=\frac{12\div4}{20\div4}=\frac{3}{5}$

15. (C): Shaded fraction of Fig. (X) = $\frac{4}{8}=\frac{1}{2}$

Figure in option	Unshaded fraction
A	$\frac{3}{5}$
B	$\frac{1}{3}$
C	$\frac{4}{8}=\frac{1}{2}$
D	$\frac{3}{4}$

16. (A): Total number of shapes = 16
Number of circles = 5

So, required fraction = $\frac{5}{16}$

17. (D): Total number of children = 40
Since, fraction of class that was present on Monday

$=\frac{31}{40}$

$\Rightarrow\frac{\text{Number of children present on Monday}}{\text{Total number of children}}=\frac{31}{40}$

$\Rightarrow\frac{\text{Number of children present on Monday}}{40}=\frac{31}{40}$

$\therefore$ Number of children present on Monday = 31
$\Rightarrow$ Number of children absent on Monday

= 40 – 31 = 9

18. (C): Total number of days of trip = 15
Number of days spent in Manali = 7
So, number of days spent in Shimla = 15 – 7 = 8

$\therefore$ Fraction of trip spent in Shimla = $\frac{8}{15}$

19. (C): Option (C) is incorrect, as $\frac{35}{3}=11\frac{2}{3}$

20. (B): Shaded fraction of given figure = $\frac{10}{18}=\frac{5}{9}$

(A) Shaded fraction = $\frac{4}{6}=\frac{2}{3}$

(B) Shaded fraction = $\frac{5}{9}$

(C) Shaded fraction = $\frac{4}{8}=\frac{1}{2}$

21. (B): Total number of equal parts = 40

Total number of unshaded parts = 28

$\therefore$ Required fraction = $\frac{28}{40}=\frac{28\div 4}{40\div 4}=\frac{7}{10}$

22. (B): $\frac{4}{27}+\frac{10}{9}+\frac{32}{27}$

$=\frac{4}{27}+\frac{10\times 3}{9\times 3}+\frac{32}{27}$

$=\frac{4}{27}+\frac{30}{27}+\frac{32}{27}=\frac{4+30+32}{27}$

$=\frac{66}{27}=\frac{66\div 3}{27\div 3}=\frac{22}{9}=2\frac{4}{9}$

23. (D): We have, $\frac{\bigstar}{5}-1\frac{3}{10}=\frac{1}{10}$

i.e., $\frac{\bigstar}{5}-\frac{13}{10}=\frac{1}{10}\Rightarrow\frac{\bigstar}{5}=\frac{1}{10}+\frac{13}{10}$

$\Rightarrow\frac{\bigstar}{5}=\frac{14}{10}\Rightarrow\frac{\bigstar}{5}=\frac{7}{5}\Rightarrow\bigstar=7$

24. (D)

25. (A): Number of females left the stadium

$=\frac{4}{10}\times 2500=1000$

So, number of females in the stadium = 2500 – 1000 = 1500

So, number of persons left in the stadium after 2 hours = 4500 + 1500 = 6000

26. (B): $\frac{1}{4}$ of 328 = 328 ÷ 4 = 82

$\frac{1}{7}$ of 147 = 147 ÷ 7 = 21

$\therefore$ Required difference = 82 – 21 = 61

27. (D): Number of cupcakes Pooja had = 45

Number of cupcakes she ate = 5

Number of cupcakes she gave to her 3 friends = 3 × 5 = 15

So, number of cupcakes left with her = 45 – 5 – 15 = 25

$\therefore$ Fraction of cupcakes left with her = $\frac{25}{45}=\frac{5}{9}$

28. (D): (A) Shaded fraction = $\frac{3}{7}$

(B) Shaded fraction = $\frac{5}{7}$

(C) Shaded fraction = $\frac{4}{8}=\frac{1}{2}$

(D) Shaded fraction = $\frac{4}{7}$

29. (B): $2\frac{1}{5}+1\frac{3}{5}=3+\boxed{?}$

$\Rightarrow\frac{11}{5}+\frac{8}{5}=3+\boxed{?}\Rightarrow\frac{19}{5}=3+\boxed{?}$

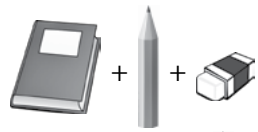
$\Rightarrow\boxed{?}=\frac{19}{5}-3$

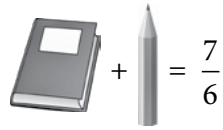
$=\frac{19}{5}-\frac{3\times 5}{1\times 5}=\frac{19}{5}-\frac{15}{5}=\frac{4}{5}$

30. (D): Required difference = $\frac{4}{8}-\frac{1}{3}=\frac{1}{2}-\frac{1}{3}$

$=\frac{1\times 3}{2\times 3}-\frac{1\times 2}{3\times 2}=\frac{3}{6}-\frac{2}{6}=\frac{1}{6}$

31. (B): We have,

 ...(1)

Also,  ...(2)

From (1) & (2), we have

$\Rightarrow$  $=\frac{17}{12}-\frac{7}{6}=\frac{17}{12}-\frac{7\times 2}{6\times 2}=\frac{17}{12}-\frac{14}{12}=\frac{3}{12}$

Also, 

$\Rightarrow$ 

$\Rightarrow$ 

32. (B): (p) $\frac{4}{3}+\frac{3}{9}=\frac{4\times3}{3\times3}+\frac{3}{9}=\frac{12}{9}+\frac{3}{9}$

$=\frac{12+3}{9}=\frac{15}{9}=\frac{5}{3}=1\frac{2}{3}$

(q) $\frac{8}{5}-\frac{3}{15}=\frac{8\times3}{5\times3}-\frac{3}{15}=\frac{24}{15}-\frac{3}{15}$

$=\frac{24-3}{15}=\frac{21}{15}=\frac{7}{5}=1\frac{2}{5}$

(r) $\frac{7}{9}-\frac{1}{5}=\frac{7\times5}{9\times5}-\frac{1\times9}{5\times9}=\frac{35}{45}-\frac{9}{45}=\frac{35-9}{45}=\frac{26}{45}$

(s) $\frac{12}{13}+\frac{8}{13}=\frac{12+8}{13}=\frac{20}{13}=1\frac{7}{13}$

33. (B) **34. (C)**

35. (D): Total number of students = 126

(a) Number of students choose to join swimming

$=\frac{1}{7}$ of 126 = 126 ÷ 7 = 18

(b) Total number of students choose swimming = 18

∴ Remaining number of students = 126 – 18 = 108

Number of students choose to join running

$=\frac{1}{3}$ of 108 = 108 ÷ 3 = 36

So, number of more students choose to join running than swimming = 36 – 18 = 18

SOF IMO 2019 QUESTIONS

1. (D): Total number of equal triangles = 16

Shaded fraction = $\frac{1}{4}$

So, number of triangles shaded to get $\frac{1}{4}$ shaded fraction = $\frac{1}{4}\times16=4$

Number of triangles already shaded = 8

Therefore number of triangles that must be unshaded = 8 – 4 = 4

2. (B): Total number of cards = 12

Number of cat cards = 5

So, required fraction = $\frac{5}{12}$

3. (B): Let total capacity of jar be 1.

Then, fraction of jar filled with milk = $\frac{1}{5}$

Fraction of jar filled with water = $\frac{2}{5}$

So, fraction of jar remains empty = $1-\left(\frac{1}{5}+\frac{2}{5}\right)$

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

4. (D): Required difference = $\frac{3}{4}-\frac{4}{8}=\frac{3}{4}-\frac{1}{2}$

$=\frac{3}{4}-\frac{1\times2}{2\times2}=\frac{3}{4}-\frac{2}{4}$

$=\frac{1}{4}$

5. (A): Total number of gems = 320

Number of red gems = 150

∴ Number of white gems = 320 – 150 = 170

∴ Required fraction = $\frac{170}{320}=\frac{17}{32}$

6. (A): Number of alphabets in the word EXPRESSION = 10

Number of vowels (E, E, I, O) = 4

∴ Required fraction = $\frac{4}{10}=\frac{2}{5}$

So, Kavya has written the incorrect statement.

Now, 2 times of $\frac{15}{12}+3$ times of $\frac{18}{12}$

$=2\times\frac{15}{12}+3\times\frac{18}{12}=\frac{30}{12}+\frac{54}{12}$

$=\frac{84}{12}=7$

So, Shruti has written the correct statement.

7. (A): (P) Unshaded fraction = $\frac{2}{8}+\frac{2}{8}+\frac{5}{8}=\frac{9}{8}$

(Q) Unshaded fraction = $\frac{4}{8}+\frac{6}{8}+\frac{5}{8}=\frac{15}{8}$

(R) Unshaded fraction = $\frac{3}{8}+\frac{3}{8}+\frac{1}{8}=\frac{7}{8}$

(S) Unshaded fraction = $\frac{2}{6}+\frac{3}{6}+\frac{3}{6}=\frac{8}{6}=\frac{4}{3}$