Holiday Homework
CLASS –VIII

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Subject - English

SUBJECT ENRICHMENT ACTIVITIES
(in subject enrichment copy for the written work)

1. Write three stories
2. Write two poems that you like the most
3. Write two poems of your own
4. Write ten amazing facts on Mountain climbing
5. Paste/draw the picture of Children at work and write a paragraph on "Child labour "
6. Write the three VERB FORMS of any 30 verbs
7. Read English news paper, magazines,comics, story books every day.
8. Listen to English news atleast ten to twenty minutes.
9. Write one page in the handwriting copy everyday(2/5/23 to20/6/23)

IN HOMEWORK COPY

1.Which part of the story,"THE BEST CHRISTMAS PRESENT IN THE WORLD" do you like the most and why?
2.Write a paragraph on "ANCIENT INDIAN EDUCATION SYSTEM "
3.Write an article on "NEW EDUCATION SYSTEM OF INDIA"
4.Describe the CAMEL and paste the related photos/ draw it.
4. Write ten amazing POINTS ON MOUNTAINEERING

विषय - हिंदी

पाठ - 1

1. 'ध्वनि, लाख की चूड़ियां और अहमद नगर का क़िला के सभी प्रश्नोत्तर याद करें ।

2. कोई भी एक हिंदी कविता तथा कोई एक हिंदी कहानी याद करें । (कविता 1-3 मिनट और कहानी 2-3 मिनट)
3. अनुच्छेद लिखें :- क. विद्यार्थी जीवन और अनुशासन

ख. भारत के विकास में युवाओं का योगदान । (150 शब्द)

4. पर्यावरण संरक्षण को लेकर दो मित्रों के बीच कम से कम 30 वाक्यों में संवाद लिखिए ।

5. अपने छोटे भाई या बहन को कोरोना से किस प्रकार सतर्क रहें कि सीख देते हुए पत्र लिखिए ।

6. आपकी छुट्टियों के केवल 15 दिनों की डायरी लिखिए । (कोई भी 15 दिन)

7. निम्नलिखित फ़िल्में देखिए और उनसे मिलने वाली पाँच प्रमुख शिक्षाएँ लिखिए :—

i :- https://youtu.be/gZy4vIGf7MY
I am kalam

ii :- https://youtu.be/CPXkijYI9Y0
Chalk n duster

iii :- https://youtu.be/a1G1Sg3-g2g
Taare zameen par

iv :- https://youtu.be/l3Sqdk88gH4
Baghban

8. 120 शब्दों में कोई एक मौलिक / स्वरचित कहानी लिखिए ।

9. समास की परिभाषा , भेदों के नाम लिखिए ।

10. उपसर्ग और प्रत्यय के दस -दस उदाहरण लिखिए ।

SUBJECT- SANSKRIT

KENDRIYA VIDYALAYA NO.2 CUTTACK

ग्रीष्मकालीन अवकाश गृह कार्य

कक्षा - अष्टमी **विषयः – संस्कृत**

निर्देश:-सभी विद्यार्थी ग्रीष्मकालीन अवकाश कार्य संस्कृत कॉपी में करेंगे।

1.सरस्वती मातुः चित्रं कृत्वा सरस्वती श्लोकं लिखत।(माँ सरस्वती का चित्र बनाकर श्लोक लिखे।)

2. दशपक्षिणां नाम चित्रैः सह संस्कृतेन लिखत। (दस पक्षियों के नाम संस्कृत में चित्र सहित लिखिए।)

3.दश शाकस्य चित्रं कृत्वा तेषां नामानि संस्कृतेन लिखत।(10 सब्जियों का चित्र बनाकर संस्कृत में उनका नाम लिखो।)

4. 1 तः 100 पर्यन्तं सङ्ख्याः संस्कृतेन लिखित्वा कण्ठस्थं कुर्वन्तु। (1 से 100 तक गिनती संस्कृत में याद करो और लिखो ।)

5. "अस्मद्" , "युष्मद्" च ' शब्दरूपाणि लिखत।(अस्मद्" , "युष्मद्" च ' शब्दरूप लिखों।)

6. "खाद्" धातुः पञ्चलकारानां रूपं लिखित्वा कण्ठस्थं कुर्वन्तु।।(लट्, लृट्, लोट्,लङ्, च विधिलिङ्ग) (खाद् धातु लट् ,लोट् , लङ्, लृट् ,विधिलिंग पांचो लकार लिखो और याद करो।)

7. विद्यायाः महत्त्वसम्बद्धाः कोऽपि श्लोकद्वयं लिखित्वा तेषां हिन्दी-अनुवादं लिखन्तु।(विद्या के महत्व संबंधित कोई दो श्लोक लिखकर उनका हिंदी अनुवाद लिखो।)

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या कुन्देन्दुतुषारहारधवला या शुभ्रवस्त्रावृता
या वीणावरदण्डमण्डितकरा या श्वेतपद्मासना
या ब्रह्माच्युतशंकरप्रभृतिभिर्देवैः सदा वन्दिता
सा मां पातु सरस्वती भगवती निःशेषजाड्यापहा (श्लोक)

जो परमेश्वरी भगवती शारदा कुंदपुष्प, चंद्र और बर्फ के हार के समान श्वेत है और श्वेत वस्त्रों से सुशोभित हो रही है जिसके हाथों में वीणा का श्रेष्ठ दंड सुशोभित है. जो श्वेत कमल पर विराजमान है जिसकी स्तुति सदा ब्रह्मा विष्णु और महेश द्वारा की जाती है. वह परमेश्वरी समस्त दुर्मति को दूर करने वाली माँ सरस्वती मेरी रक्षा करें.

- डां तृप्ति मोहान्ता

Subject - Social science

1 Why were surveys important under colonial administration ?what kind of surveys were carried out in rule ?

2 what sources do historians use in writing about the Past ?

3 what is meant by the concept of separation of power ?

4 what does the preamble to the constitution contain ?

5 draw a diagram of soil

Make the MCQs of time in each lessons 1 resources

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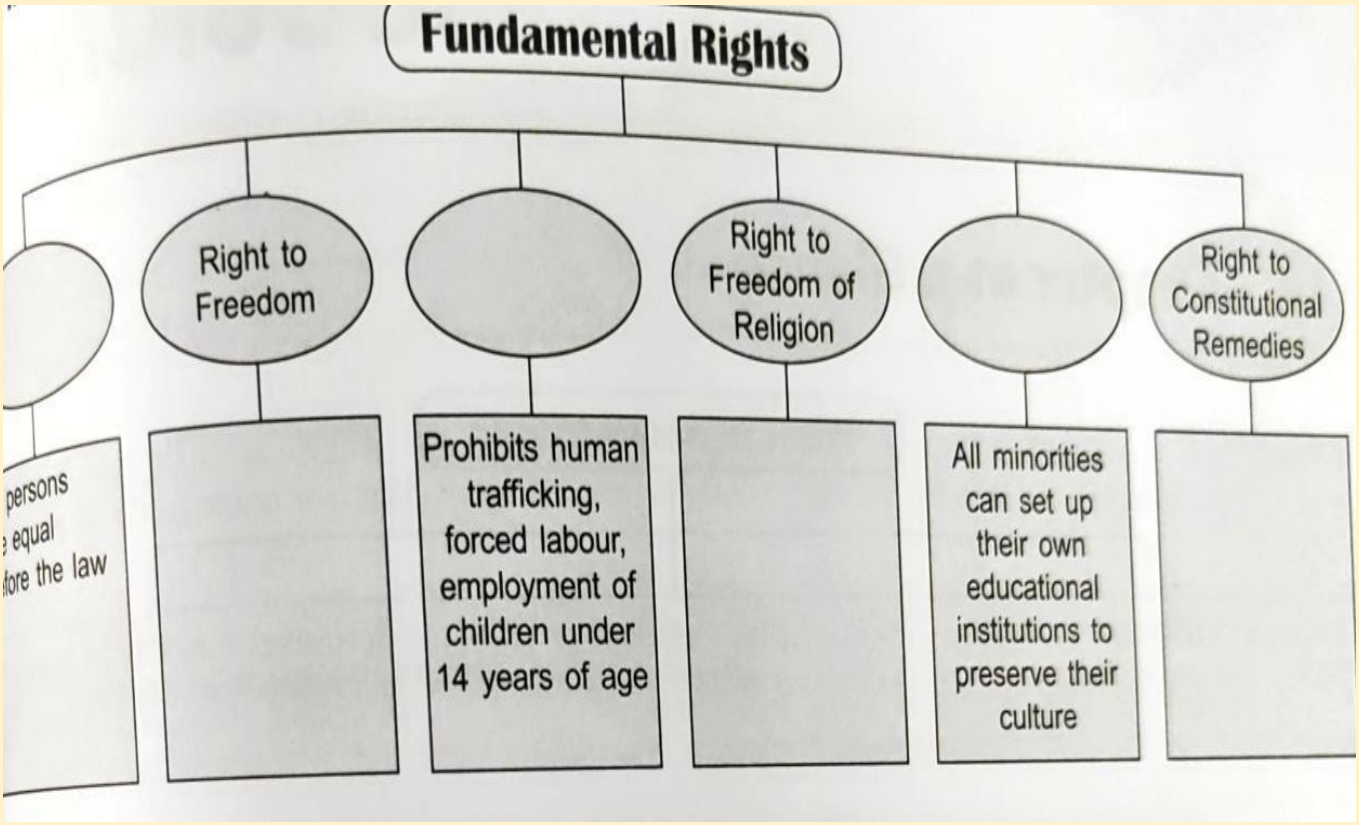
6.Fill the blanks boxes to complete the flowchart.



Subject- Science

1. Project work:

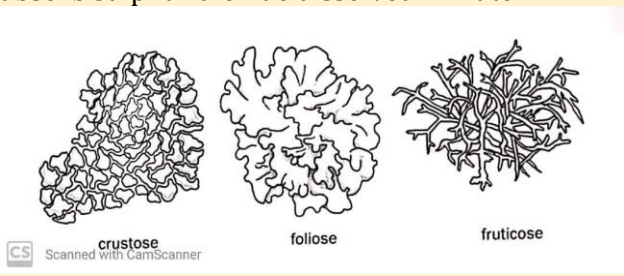
The Indian state of Sikkim is the world's first 100 per cent organic state. All farming in Sikkim is carried out without the use of synthetic fertilizers and pesticides, providing access to safer food choices and making agriculture a more environment friendly activity. Collect pictures related to organic farming in Sikkim and make a collage on an A3 size sheet. Also, state the methods used and the advantages of organic farming. (Complete it in your activity copy)

2. CCT QUESTIONS

LICHENS

Lichens are mutualistic associations of a fungus and an alga or cyanobacterium and occur as crusty patches or bushy growths on trees, rocks, and bare ground. The names given to lichens strictly refer to the fungal partner; the algae have separate names. Lichens are very sensitive to sulphur dioxide pollution in the air. Since industrialization, many lichen species have become extinct in large areas of lowland Britain, one example being the beard moss Usneaarticulata.

This is mainly due to sulphur dioxide pollution, but the loss of habitat, particularly ancient woodland, has also led to reductions in some species. Lichens are sensitive to sulphur dioxide because their efficient absorption systems result in rapid accumulation of sulphur when exposed to high levels of sulphur dioxide pollution. The algal partner seems to be most affected by the sulphur dioxide; chlorophyll is destroyed, and photosynthesis is inhibited. Lichens also absorb sulphur dioxide dissolved in water.



Lichens are widely used as environmental indicators or bio-indicators. If air is very badly polluted with sulphur dioxide there may be no lichens present, just green algae may be found. If the air is clean, shrubby, hairy, and leafy lichens become abundant. A few lichen species can tolerate quite high levels of pollution and are commonly found on pavements, walls, and tree bark in urban areas. The most sensitive lichens are shrubby and leafy while the most tolerant lichens are all crusty in appearance. Since industrialisation many of the shrubby and leafy such as Ramalina, Usnea and Lobaria species have very limited ranges,often being confined to the parts of Britain with the purest air such as northern and western Scotland and Devon and Cornwall.

a. Lichen are important in studies of atmosphere pollution because they
   i. can also grow in highly polluted atmosphere
   ii. very sensitive to pollutants
   iii. can readily multiply in polluted atmosphere
   iv. efficiently purify the atmosphere

b. The major group of algae involved in lichen formation is
   i. Red algae. ii. brown algae. iii.. Blue green algae iv. Red brown algae

c. The town center of a city experiences very high levels of Sulphur dioxide pollution from vehicles during the rush hours. Encircle ‘yes’ or ‘no’ to the statements in the table below.

Types of lichens that will be found in any town center	Yes or No?
Crustose (crusty) lichens	Yes / No
Foliose (leafy) lichens	Yes / No
Fruticose (shrubby) lichens	Yes / No
No lichens present at all	Yes / No

d. Students from a school have been asked to investigate the link between lichen growth and air pollution. They decide to survey the types of lichens growing in their town. Which method will give them the best results?

i. survey the types of lichens found in the town center, and in the countryside 5km outside the town

ii. Survey the types of lichens found in the town center, and 1km, 2km, 3km, 4km and 5km from the town center.

iii. Survey the types of lichens in the town center only

iv. Survey the types of lichens found in the countryside only

e. There is a large industrial estate on the edge of a town. What pattern of lichens do you think the students will see in the results of their survey?

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3. Flash cards/Index cards:

Make the flash cards of different microorganisms(Draw/paste their photos, write their name, type, helpful/harmful and other details in brief) and of different agricultural implements (paste/draw the pictures, write the uses ot it) and paste these in the subject enrichment notebook in a queue.

4. Extra questions:

Complete the NCERT exemplar questions sent in WhatsApp group. Only write down the answrs.

5. Multi disciplinary project:

Theme: Agriculture

Topic: Modern day agriculture

Suggested Activities:

(i) What are the modern techniques or tools are being used for different agricultural agricultural practices.

(ii) What is the need of modern tools or techniques in agricultural field.

(iii) What are the benefits of using modern techniques (Such as sprinkler system, green house etc) and modern tools (Tractor, combine machine, seed drill etc)

***Note: These are only the suggested Activities, you can add the topics on your own. Must attach all the required pictures)**

SUBJECT: WE

SL NO	CLASS	TOPIC/THEME	ASSIGNMENT	TLO/Skill
01	VIII	Cover design, Best out of waste, origami(geometrical)	Origami work(04) Pencil cutting crafts(04)	To make various designs Creativity

SUBJECT: ART

1. Make any five 3D craft work

Reference :
https://www.youtube.com/shorts/P2yhWk51zXI
youtube.com/watch?v=pDkUlrJFVaE

2. Draw any five potraits ,2D (colour or shading)
Reference :
https://www.youtube.com/shorts/FndjSSmij3s
https://www.youtube.com/shorts/WNEgdUxlXO4

SUBJECT : AI

A. Answer the following questions.

1. What do you mean by browser fingerprinting?
2. What is McCarthy's definition of AI?
3. List any two challenges in achieving true AI for machines.
4. What do you mean by sensing and reasoning?

B. Prepare a 1000 words write-up or a 5 slide presentation on **How insects Inspire Artificial Intelligence.**

Submit homework on very first day after reopening of Vidyalaya

आप सभी स्वस्थ रहें , मस्त रहें , ख़ुश रहें , सीखते रहें , पेरेंट्स की सहायता करते रहें । बहुत बहुत आशीर्वाद आप सभी को।

----------Wish you all a very happy vacation, take care----------

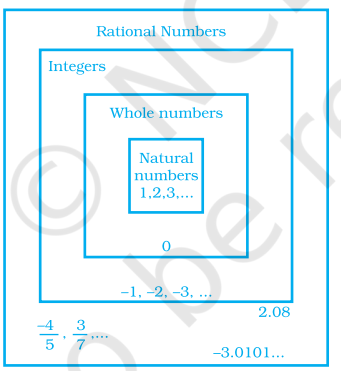
UNIT 1

RATIONAL NUMBERS

(A) Main Concepts and Results

- A number that can be expressed in the form $\frac{p}{q}$, where p and q are integers and $q \neq 0$, is called a **rational number**.

- **Lowest form of a rational number –** A rational number $\frac{p}{q}$ is said to be in the lowest form or simplest form if p and q have no common factor other than 1 and $q \neq 0$.



Addition, subtraction, multiplication and division of rational numbers are done in the same way as we do for fractions.

- Rational numbers are closed under the operations of addition, subtraction and multiplication.
- The operations of addition and multiplication for rational numbers are

  (i) commutative, (ii) associative

- The rational number 0 is the additive identity for rational numbers.
- The rational number 1 is the multiplicative identity for rational numbers.

- The additive inverse of the rational number $\frac{a}{b}$ is $\frac{-a}{b}$ and vice-versa.
- The reciprocal or multiplicative inverse of the rational number $\frac{a}{b}$ is $\frac{c}{d}$ if $\frac{a}{b}\times\frac{c}{d}=1$.
- **Distributivity of rational numbers –** For all rational numbers a, b and c

  $a\,(b + c) = ab + ac$

  $a\,(b - c) = ab - ac$
- Rational numbers can be represented on a number line.
- Between any two given rational numbers there are infinitely many rational numbers. The idea of **mean** helps us to find rational numbers between two given rational numbers.

(B) Solved Examples

In examples 1 to 3, there are four options out of which one is correct. Choose the correct answer.

Example 1 : Which of the following is not true?

(a) $\frac{2}{3}+\frac{5}{4}=\frac{5}{4}+\frac{2}{3}$ (b) $\frac{2}{3}-\frac{5}{4}=\frac{5}{4}-\frac{2}{3}$

(c) $\frac{2}{3}\times\frac{5}{4}=\frac{5}{4}\times\frac{2}{3}$ (d) $\frac{2}{3}\div\frac{5}{4}=\frac{2}{3}\times\frac{4}{5}$

Solution : The correct answer is (b).

Example 2 : Multiplicative inverse of $\frac{0}{1}$ is

(a) 1 (b) –1 (c) 0 (d) not defined

Solution : The correct answer is (d).

Example 3 : Three rational numbers lying between $\frac{-3}{4}$ and $\frac{1}{2}$ are

(a) $-\frac{1}{2}, 0, \frac{3}{4}$ (b) $\frac{-1}{4}, \frac{1}{4}, \frac{3}{4}$

(c) $\frac{-1}{4}, 0, \frac{1}{4}$ (d) $\frac{-5}{4}, 0, \frac{1}{4}$

Solution : The correct answer is (c).

In examples 4 and 5, fill in the blanks to make the statements true.

Example 4 : The product of a non-zero rational number and its reciprocal is _____.

Solution : 1

Example 5 : If $x = \frac{1}{3}$ and $y = \frac{6}{7}$ then $xy - \frac{y}{x} =$ _____.

Solution : $\frac{-16}{7}$

In examples 6 and 7, state whether the given statements are true or false.

Example 6 : Every rational number has a reciprocal.

Solution : False

Example 7 : $\frac{-4}{5}$ is larger than $\frac{-5}{4}$.

Solution : True

Example 8 : Find $\frac{4}{7} \times \frac{14}{3} \div \frac{2}{3}$.

Solution : $\frac{4}{7} \times \frac{14}{3} \div \frac{2}{3} = \frac{4}{7} \times \left(\frac{14}{3} \times \frac{3}{2}\right)$

$= \frac{4}{7} \times 7 = 4$

Example 9 : Using appropriate properties, find $\frac{2}{3} \times \frac{-5}{7} + \frac{7}{3} + \frac{2}{3} \times \frac{-2}{7}$.

Solution : $\frac{2}{3} \times \left(\frac{-5}{7}\right) + \frac{7}{3} + \frac{2}{3} \times \left(\frac{-2}{7}\right)$

$= \frac{-5}{7} \times \frac{2}{3} - \frac{2}{7} \times \frac{2}{3} + \frac{7}{3}$

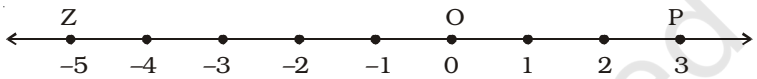
$$= \left(\frac{-5}{7} - \frac{2}{7}\right) \times \frac{2}{3} + \frac{7}{3}$$

$$= -\frac{2}{3} + \frac{7}{3} = \frac{5}{3}$$

Example 10 : Let O, P and Z represent the numbers 0, 3 and -5 respectively on the number line. Points Q, R and S are between O and P such that OQ = QR = RS = SP.

What are the rational numbers represented by the points Q, R and S. Next choose a point T between Z and O so that ZT = TO. Which rational number does T represent?

Solution :



As OQ = QR = RS = SP

and OQ + QR + RS + SP = OP

therefore Q, R and S divide OP into four equal parts.

So, R is the mid-point of OP, i.e. $R = \frac{0+3}{2} = \frac{3}{2}$

Q is the mid-point of OR, i.e. $Q = \frac{1}{2}\left(0 + \frac{3}{2}\right) = \frac{3}{4}$

and S is the mid-point of RP, i.e. $S = \frac{1}{2}\left(\frac{3}{2} + 3\right) = \frac{9}{4}$

therefore, $Q = \frac{3}{4}$, $R = \frac{3}{2}$ and $S = \frac{9}{4}$

Also Z T = TO

So, T is the mid-point of OZ, i.e. $T = \frac{0+(-5)}{2} = \frac{-5}{2}$

Think and Discuss

1. **Explain** the first step in solving an addition equation with fractions having *like* denominators.
2. **Explain** the first step in solving an addition equation with fractions having *unlike* denominators.

Example 11 : A farmer has a field of area $49\frac{4}{5}$ ha. He wants to divide it equally among his one son and two daughters. Find the area of each one's share.
(ha means hectare; 1 hectare = 10,000 m^2)

Solution : $49\frac{4}{5}$ ha = $\frac{249}{5}$ ha

Each share = $\frac{1}{3} \times \frac{249}{5}$ ha = $\frac{83}{5}$ ha = $16\frac{3}{5}$ ha

Example 12 : Let a, b, c be the three rational numbers where $a = \frac{2}{3}$, $b = \frac{4}{5}$ and $c = -\frac{5}{6}$

Verify:
(i) $a + (b + c) = (a + b) + c$ (Associative property of addition)
(ii) $a \times (b \times c) = (a \times b) \times c$ (Associative property of multiplication)

Solution : (i) L.H.S $= a + (b + c)$

$$= \frac{2}{3} + \left[\frac{4}{5} + \left(\frac{-5}{6}\right)\right]$$

$$= \frac{2}{3} + \left[\frac{24 - 25}{30}\right]$$

$$= \frac{2}{3} + \left(\frac{-1}{30}\right)$$

$$= \frac{20 - 1}{30} = \frac{19}{30}$$

R.H.S. of (i) $= (a + b) + c$

$$= \left(\frac{2}{3} + \frac{4}{5}\right) + \left(\frac{-5}{6}\right)$$

$$= \left(\frac{10 + 12}{15}\right) + \left(\frac{-5}{6}\right)$$

$$= \frac{22}{15} - \frac{5}{6} = \frac{44 - 25}{30} = \frac{19}{30}$$

So, $\frac{2}{3} + \left[\frac{4}{5} + \left(\frac{-5}{2}\right)\right] = \left(\frac{2}{3} + \frac{4}{5}\right) + \left(\frac{-5}{6}\right)$

Hence verified.

(ii) L.H.S $= a \times (b \times c)$

$$= \frac{2}{3} \times \left[\frac{4}{5} \times \left(\frac{-5}{6}\right)\right]$$

$$= \frac{2}{3} \times \left(\frac{-20}{30}\right) = \frac{2}{3} \times \left(\frac{-2}{3}\right)$$

$$= \frac{2 \times (-2)}{3 \times 3} = \frac{-4}{9}$$

R.H.S. $= (a \times b) \times c$

$$= \left(\frac{2}{3} \times \frac{4}{5}\right) \times \left(\frac{-5}{6}\right)$$

$$= \frac{2 \times 4}{3 \times 5} \times \frac{-5}{6}$$

$$= \frac{8}{15} \times \left(\frac{-5}{6}\right)$$

$$= \frac{8 \times (-5)}{15 \times 6} = \frac{-40}{90} = \frac{-4}{9}$$

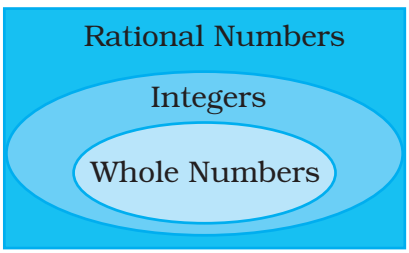
So, $\frac{2}{3} \times \left[\frac{4}{5} \times \left(\frac{-5}{6}\right)\right] = \left[\frac{2}{3} \times \frac{4}{5}\right] \times \left(\frac{-5}{6}\right)$

Example 13 : Solve the following questions and write your observations.

(i) $\frac{5}{3} + 0 = ?$ (ii) $\frac{-2}{5} + 0 = ?$ (iii) $\frac{3}{7} + 0 = ?$

(iv) $\frac{2}{3} \times 1 = ?$ (v) $\frac{-6}{7} \times 1 = ?$ (vi) $\frac{9}{8} \times 1 = ?$

Solution : (i) $\frac{5}{3} + 0 = \frac{5}{3}$ (ii) $\frac{-2}{5} + 0 = \frac{-2}{5}$ (iii) $\frac{3}{7} + 0 = \frac{3}{7}$



(iv) $\frac{2}{3} \times 1 = \frac{2}{3}$ (v) $\frac{-6}{7} \times 1 = \frac{-6}{7}$ (vi) $\frac{9}{8} \times 1 = \frac{9}{8}$

Observation

From (i) to (iii), we observe that: (i) When we add 0 to a rational number we get the same rational number.
From (iv) to (vi), we observe that: (ii) When we multiply a rational number by 1 we get the same rational number.
(iii) Therefore, 0 is the **additive identity** of rational numbers and 1 is the **'multiplicative identity'** of rational numbers.

Example 14 : Write any 5 rational numbers between $\frac{-5}{6}$ and $\frac{7}{8}$.

Solution : $\frac{-5}{6} = \frac{-5 \times 4}{6 \times 4} = \frac{-20}{24}$

and $\frac{7}{8} = \frac{7 \times 3}{8 \times 3} = \frac{21}{24}$

Thus, rational numbers $\frac{-19}{24}, \frac{-18}{24}, \frac{-17}{24}, \ldots\ldots \frac{20}{24}$ lie between $\frac{-5}{6}$ and $\frac{7}{8}$.

Example 15 : Identify the rational number which is different from the other three : $\frac{2}{3}, \frac{-4}{5}, \frac{1}{2}, \frac{1}{3}$. Explain your reasoning.

Solution : $\frac{-4}{5}$ is the rational number which is different from the other three, as it lies on the left side of zero while others lie on the right side of zero on the number line.

Example 16 : **Problem Solving Strategies**

Problem : The product of two rational numbers is –7. If one of the number is –10, find the other.

Solution : Understand and explore

- What information is given in the question?
  One of the two rational numbers
  Product of two rational numbers
- What are you finding?
  The other rational number

Plan a strategy

- Let the unknown rational number be x. Form an equation with the conditions given. Then solve the equation.

Solve

Let the other rational number be x

$-10 \times x = -7$

$x = \frac{-7}{-10}$, $x = \frac{7}{10}$

Check

$-10 \times \frac{7}{10} = -7$. Hence, the result is correct.

Think and Discuss

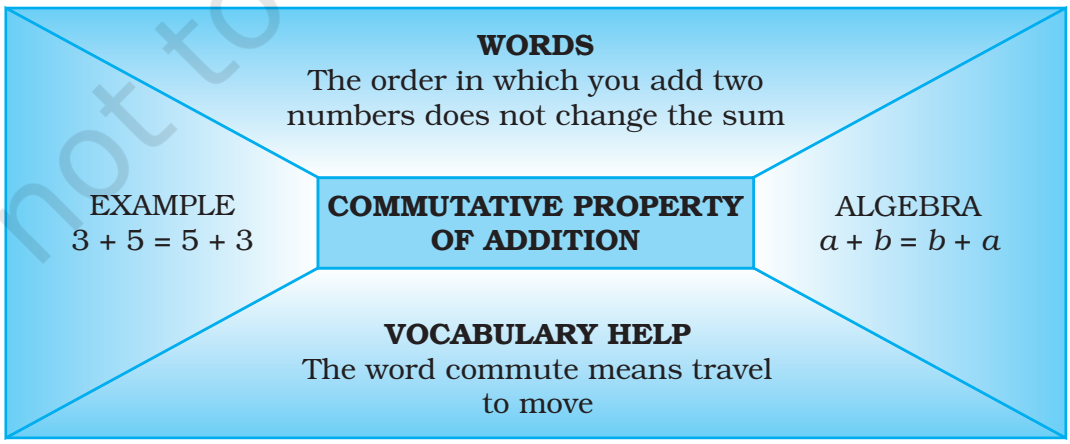
Some other easier ways to find the answer.

Is the product greater than both the rational numb or less than both the rational numbers?

Note taking Skills

Focus on Graphic Organisers

You can use an information frame to organize information about a mathematical concept or property, such as the commutative property of addition.



Make an information frame for the distributive property.

(C) Exercise

In questions 1 to 25, there are four options out of which one is correct. Choose the correct answer.

1. A number which can be expressed as $\frac{p}{q}$ where p and q are integers and $q \neq 0$ is

(a) natural number. (b) whole number.
(c) integer. (d) rational number.

2. A number of the form $\frac{p}{q}$ is said to be a rational number if

(a) p and q are integers.
(b) p and q are integers and $q \neq 0$
(c) p and q are integers and $p \neq 0$
(d) p and q are integers and $p \neq 0$ also $q \neq 0$.

3. The numerical expression $\frac{3}{8}+\frac{(-5)}{7}=\frac{-19}{56}$ shows that

(a) rational numbers are closed under addition.
(b) rational numbers are not closed under addition.
(c) rational numbers are closed under multiplication.
(d) addition of rational numbers is not commutative.

4. Which of the following is not true?

(a) rational numbers are closed under addition.
(b) rational numbers are closed under subtraction.
(c) rational numbers are closed under multiplication.
(d) rational numbers are closed under division.

5. $-\frac{3}{8}+\frac{1}{7}=\frac{1}{7}+\left(\frac{-3}{8}\right)$ is an example to show that

(a) addition of rational numbers is commutative.
(b) rational numbers are closed under addition.
(c) addition of rational number is associative.
(d) rational numbers are distributive under addition.

6. Which of the following expressions shows that rational numbers are associative under multiplication.

(a) $\frac{2}{3}\times\left(\frac{-6}{7}\times\frac{3}{5}\right) = \left(\frac{2}{3}\times\frac{-6}{7}\right)\times\frac{3}{5}$

(b) $\frac{2}{3}\times\left(\frac{-6}{7}\times\frac{3}{5}\right) = \frac{2}{3}\times\left(\frac{3}{5}\times\frac{-6}{7}\right)$

(c) $\frac{2}{3}\times\left(\frac{-6}{7}\times\frac{3}{5}\right) = \left(\frac{3}{5}\times\frac{2}{3}\right)\times\frac{-6}{7}$

(d) $\left(\frac{2}{3}\times\frac{-6}{7}\right)\times\frac{3}{5} = \left(\frac{-6}{7}\times\frac{2}{3}\right)\times\frac{3}{5}$

7. Zero (0) is

(a) the identity for addition of rational numbers.

(b) the identity for subtraction of rational numbers.

(c) the identity for multiplication of rational numbers.

(d) the identity for division of rational numbers.

8. One (1) is

(a) the identity for addition of rational numbers.

(b) the identity for subtraction of rational numbers.

(c) the identity for multiplication of rational numbers.

(d) the identity for division of rational numbers.

9. The additive inverse of $\frac{-7}{19}$ is

(a) $\frac{-7}{19}$ (b) $\frac{7}{19}$ (c) $\frac{19}{7}$ (d) $\frac{-19}{7}$

10. Multiplicative inverse of a negative rational number is

(a) a positive rational number.

(b) a negative rational number.

(c) 0

(d) 1

11. If $x + 0 = 0 + x = x$, which is rational number, then 0 is called

(a) identity for addition of rational numbers.

(b) additive inverse of x.

(c) multiplicative inverse of x.

(d) reciprocal of x.

12. To get the product 1, we should multiply $\frac{8}{21}$ by

(a) $\frac{8}{21}$ (b) $\frac{-8}{21}$ (c) $\frac{21}{8}$ (d) $\frac{-21}{8}$

13. $-(-x)$ is same as

(a) $-x$ (b) x (c) $\frac{1}{x}$ (d) $\frac{-1}{x}$

14. The multiplicative inverse of $-1\frac{1}{7}$ is

(a) $\frac{8}{7}$ (b) $\frac{-8}{7}$ (c) $\frac{7}{8}$ (d) $\frac{7}{-8}$

15. If x be any rational number then $x + 0$ is equal to

(a) x (b) 0 (c) $-x$ (d) Not defined

16. The reciprocal of 1 is

(a) 1 (b) -1 (c) 0 (d) Not defined

17. The reciprocal of -1 is

(a) 1 (b) -1 (c) 0 (d) Not defined

18. The reciprocal of 0 is

(a) 1 (b) -1 (c) 0 (d) Not defined

19. The reciprocal of any rational number $\frac{p}{q}$, where p and q are integers and $q \neq 0$, is

(a) $\frac{p}{q}$ (b) 1 (c) 0 (d) $\frac{q}{p}$

20. If y be the reciprocal of rational number x, then the reciprocal of y will be

(a) x (b) y (c) $\frac{x}{y}$ (d) $\frac{y}{x}$

21. The reciprocal of $\frac{-3}{8}\times\left(\frac{-7}{13}\right)$ is

(a) $\frac{104}{21}$ (b) $\frac{-104}{21}$ (c) $\frac{21}{104}$ (d) $\frac{-21}{104}$

22. Which of the following is an example of distributive property of multiplication over addition for rational numbers.

(a) $-\frac{1}{4}\times\left\{\frac{2}{3}+\left(\frac{-4}{7}\right)\right\}=\left[-\frac{1}{4}\times\frac{2}{3}\right]+\left[-\frac{1}{4}\times\left(\frac{-4}{7}\right)\right]$

(b) $-\frac{1}{4}\times\left\{\frac{2}{3}+\left(\frac{-4}{7}\right)\right\}=\left[\frac{1}{4}\times\frac{2}{3}\right]-\left(\frac{-4}{7}\right)$

(c) $-\frac{1}{4}\times\left\{\frac{2}{3}+\left(\frac{-4}{7}\right)\right\}=\frac{2}{3}+\left(-\frac{1}{4}\right)\times\frac{-4}{7}$

(d) $-\frac{1}{4}\times\left\{\frac{2}{3}+\left(\frac{-4}{7}\right)\right\}=\left\{\frac{2}{3}+\left(\frac{-4}{7}\right)\right\}-\frac{1}{4}$

23. Between two given rational numbers, we can find

(a) one and only one rational number.

(b) only two rational numbers.

(c) only ten rational numbers.

(d) infinitely many rational numbers.

Plan a strategy

- Some problems contain a lot of information. Read the entire problem carefully to be sure you understand all the facts. You may need to read it over several times, perhaps aloud so that you can hear yourself and understand it well.
- Then decide which information is most important (prioritise). Is there any information that is absolutely necessary to solve the problem? This information is most important.
- Finally, put the information in order (sequence). Use comparison words like *before*, *after*, *longer*, *shorter*, and so on to help you. Write down the sequence before you try to solve the problem.

Read the problem given below, and then answer the questions that follow

- Five friends are standing in line for the opening of a show. They are in line according to their arrival. Shreya arrived 3 minutes after Sachin. Roy took his place in line at 9:01 P.M. He was 1 minute behind Reena and 7 minutes ahead of Shreya. The first person arrived at 9:00 P.M. Babu showed up 6 minutes after the first person. List the time of each person's arrival.

  (a) Whose arrival information helped you determine each person's arrival time?

  (b) Can you determine the order without the time?

  (c) List the friends' order of arrival from the earliest to the last.

24. $\frac{x+y}{2}$ is a rational number.

(a) Between x and y

(b) Less than x and y both.

(c) Greater than x and y both.

(d) Less than x but greater than y.

25. Which of the following statements is always true?

(a) $\frac{x-y}{2}$ is a rational number between x and y.

(b) $\frac{x+y}{2}$ is a rational number between x and y.

(c) $\frac{x \times y}{2}$ is a rational number between x and y.

(d) $\frac{x \div y}{2}$ is a rational number between x and y.

In questions 26 to 47, fill in the blanks to make the statements true.

26. The equivalent of $\frac{5}{7}$, whose numerator is 45 is _____.

27. The equivalent rational number of $\frac{7}{9}$, whose denominator is 45 is _____.

28. Between the numbers $\frac{15}{20}$ and $\frac{35}{40}$, the greater number is _____.

29. The reciprocal of a positive rational number is _____.

30. The reciprocal of a negative rational number is _____.

31. Zero has _____ reciprocal.

32. The numbers _____ and _____ are their own reciprocal.

33. If y be the reciprocal of x, then the reciprocal of y^2 in terms of x will be _____.

34. The reciprocal of $\frac{2}{5} \times \left(\frac{-4}{9}\right)$ is _____.

35. $(213 \times 657)^{-1} = 213^{-1} \times$ _____.

36. The negative of 1 is _____.

Writing Strategy:

Write a Convincing Argument

Your ability to write a convincing argument proves that you have understanding of the concept. An effective argument should include the following four parts:

(1) A goal

(2) A response to the goal

(3) Evidence to support the response

(4) A summary statement

Write about it

Compare 10^2 and 2^{10}. For any two numbers, what usually gives the greater number, using the greater number as the base or as the exponent? Give at least one exception.

Step 1 : Identify the goal

For any two numbers, explain whether using the greater number as the base will generally result in a greater number or using it as the exponent. Find one exception.

Step 2 : Provide a response to the goal

Using the greater number as the exponent usually gives the greater number.

Step 3 : Provide evidence to support your response

For the number 10 and 2
Using the greater number, 10, as the exponent will result in a greater number.

$10^2 = 100$

$2^{10} = 1024$

$100 < 1024$

$10^2 < 2^{10}$

Exception for the numbers 2 and 3. Using the greater number, 3, as the exponent will not result in a greater number.

$3^2 = 9$

$2^3 = 8$

$9 > 8$

$3^2 > 2^3$

Step 4 : Summarise your argument

Generally, for any two numbers, using the greater number as the exponent instead of as the base will result in a greater number.

37. For rational numbers $\frac{a}{b}, \frac{c}{d}$ and $\frac{e}{f}$ we have $\frac{a}{b}\times\left(\frac{c}{d}+\frac{e}{f}\right)$ = _____ + _____.

38. $\frac{-5}{7}$ is _____ than –3.

39. There are _____ rational numbers between any two rational numbers.

40. The rational numbers $\frac{1}{3}$ and $\frac{-1}{3}$ are on the _____ sides of zero on the number line.

41. The negative of a negative rational number is always a _____ rational number.

42. Rational numbers can be added or multiplied in any _____.

43. The reciprocal of $\frac{-5}{7}$ is _____.

44. The multiplicative inverse of $\frac{4}{3}$ is _____.

45. The rational number 10.11 in the from $\frac{p}{q}$ is _____.

46. $\frac{1}{5}\times\left[\frac{2}{7}+\frac{3}{8}\right] = \left[\frac{1}{5}\times\frac{2}{7}\right]+$ _____.

47. The two rational numbers lying between –2 and –5 with denominator as 1 are _____ and _____.

In each of the following, state whether the statements are true (T) or false (F).

48. If $\frac{x}{y}$ is a rational number, then y is always a whole number.

49. If $\frac{p}{q}$ is a rational number, then p cannot be equal to zero.

50. If $\frac{r}{s}$ is a rational number, then s cannot be equal to zero.

51. $\frac{5}{6}$ lies between $\frac{2}{3}$ and 1.

52. $\frac{5}{10}$ lies between $\frac{1}{2}$ and 1.

53. $\frac{-7}{2}$ lies between –3 and –4.

54. $\frac{9}{6}$ lies between 1 and 2.

55. If $a \neq 0$, the multiplicative inverse of $\frac{a}{b}$ is $\frac{b}{a}$.

56. The multiplicative inverse of $\frac{-3}{5}$ is $\frac{5}{3}$.

57. The additive inverse of $\frac{1}{2}$ is –2.

58. If $\frac{x}{y}$ is the additive inverse of $\frac{c}{d}$, then $\frac{x}{y} + \frac{c}{d} = 0$.

59. For every rational number x, $x + 1 = x$.

60. If $\frac{x}{y}$ is the additive inverse of $\frac{c}{d}$, then $\frac{x}{y} - \frac{c}{d} = 0$

61. The reciprocal of a non-zero rational number $\frac{q}{p}$ is the rational number $\frac{q}{p}$.

62. If $x + y = 0$, then $-y$ is known as the negative of x, where x and y are rational numbers.

63. The negative of the negative of any rational number is the number itself.

64. The negative of 0 does not exist.

65. The negative of 1 is 1 itself.

66. For all rational numbers x and y, $x - y = y - x$.

67. For all rational numbers x and y, $x \times y = y \times x$.

68. For every rational number x, $x \times 0 = x$.

69. For every rational numbers x, y and z, $x + (y \times z) = (x + y) \times (x + z)$.

70. For all rational numbers a, b and c, $a(b + c) = ab + bc$.

71. 1 is the only number which is its own reciprocal.

72. –1 is not the reciprocal of any rational number.

73. For any rational number x, $x + (-1) = -x$.

74. For rational numbers x and y, if $x < y$ then $x - y$ is a positive rational number.

75. If x and y are negative rational numbers, then so is $x + y$.

76. Between any two rational numbers there are exactly ten rational numbers.

77. Rational numbers are closed under addition and multiplication but not under subtraction.

78. Subtraction of rational number is commutative.

79. $-\frac{3}{4}$ is smaller than –2.

80. 0 is a rational number.

81. All positive rational numbers lie between 0 and 1000.

82. The population of India in 2004 - 05 is a rational number.

83. There are countless rational numbers between $\frac{5}{6}$ and $\frac{8}{9}$.

84. The reciprocal of x^{-1} is $\frac{1}{x}$.

85. The rational number $\frac{57}{23}$ lies to the left of zero on the number line.

86. The rational number $\frac{7}{-4}$ lies to the right of zero on the number line.

87. The rational number $\frac{-8}{-3}$ lies neither to the right nor to the left of zero on the number line.

88. The rational numbers $\frac{1}{2}$ and –1 are on the opposite sides of zero on the number line.

89. Every fraction is a rational number.

90. Every integer is a rational number.

91. The rational numbers can be represented on the number line.

92. The negative of a negative rational number is a positive rational number.

93. If x and y are two rational numbers such that $x > y$, then $x - y$ is always a positive rational number.

94. 0 is the smallest rational number.

95. Every whole number is an integer.

96. Every whole number is a rational number.

97. 0 is whole number but it is not a rational number.

98. The rational numbers $\frac{1}{2}$ and $-\frac{5}{2}$ are on the opposite sides of 0 on the number line.

99. Rational numbers can be added (or multiplied) in any order

$$\frac{-4}{5}\times\frac{-6}{5}=\frac{-6}{5}\times\frac{-4}{5}$$

100. Solve the following: Select the rational numbers from the list which are also the integers.

$$\frac{9}{4},\frac{8}{4},\frac{7}{4},\frac{6}{4},\frac{9}{3},\frac{8}{3},\frac{7}{3},\frac{6}{3},\frac{5}{2},\frac{4}{2},\frac{3}{1},\frac{3}{2},\frac{1}{1},\frac{0}{1},\frac{-1}{1},\frac{-2}{1},\frac{-3}{2},\frac{-4}{2},\frac{-5}{2},\frac{-6}{2},$$

101. Select those which can be written as a rational number with denominator 4 in their lowest form:

$$\frac{7}{8},\frac{64}{16},\frac{36}{-12},\frac{-16}{17},\frac{5}{-4},\frac{140}{28}$$

102. Using suitable rearrangement and find the sum:

(a) $\frac{4}{7}+\left(\frac{-4}{9}\right)+\frac{3}{7}+\left(\frac{-13}{9}\right)$

(b) $-5+\frac{7}{10}+\frac{3}{7}+(-3)+\frac{5}{14}+\frac{-4}{5}$

103. Verify $-(-x) = x$ for

(i) $x=\frac{3}{5}$ (ii) $x=\frac{-7}{9}$ (iii) $x=\frac{13}{-15}$

104. Give one example each to show that the rational numbers are closed under addition, subtraction and multiplication. Are rational numbers closed under division? Give two examples in support of your answer.

105. Verify the property $x + y = y + x$ of rational numbers by taking

(a) $x=\frac{1}{2},\ y=\frac{1}{2}$ (b) $x=\frac{-2}{3},\ y=\frac{-5}{6}$

(c) $x=\frac{-3}{7},\ y=\frac{20}{21}$ (d) $x=\frac{-2}{5},\ y=\frac{-9}{10}$

106. Simplify each of the following by using suitable property. Also name the property.

(a) $\left[\frac{1}{2}\times\frac{1}{4}\right]+\left[\frac{1}{2}\times 6\right]$ (b) $\left[\frac{1}{5}\times\frac{2}{15}\right]-\left[\frac{1}{5}\times\frac{2}{5}\right]$ (c) $\frac{-3}{5}\times\left\{\frac{3}{7}+\left(\frac{-5}{6}\right)\right\}$

107. Tell which property allows you to compute

$\frac{1}{5}\times\left[\frac{5}{6}\times\frac{7}{9}\right]$ as $\left[\frac{1}{5}\times\frac{5}{6}\right]\times\frac{7}{9}$

108. Verify the property $x \times y = y \times z$ of rational numbers by using

(a) $x = 7$ and $y=\frac{1}{2}$ (b) $x=\frac{2}{3}$ and $y=\frac{9}{4}$

(c) $x=\frac{-5}{7}$ and $y=\frac{14}{15}$ (d) $x=\frac{-3}{8}$ and $y=\frac{-4}{9}$

109. Verify the property $x \times (y \times z) = (x \times y) \times z$ of rational numbers by using

(a) $x = 1,\ y=\frac{-1}{2}$ and $z=\frac{1}{4}$ (b) $x=\frac{2}{3},\ y=\frac{-3}{7}$ and $z=\frac{1}{2}$

(c) $x = \frac{-2}{7}$, $y = \frac{-5}{6}$ and $z = \frac{1}{4}$ (d) $x = 0$, $y = \frac{1}{2}$

and What is the name of this property?

110. Verify the property $x \times (y + z) = x \times y + x \times z$ of rational numbers by taking.

(a) $x = \frac{-1}{2}$, $y = \frac{3}{4}$, $z = \frac{1}{4}$

(b) $x = \frac{-1}{2}$, $y = \frac{2}{3}$, $z = \frac{3}{4}$

(c) $x = \frac{-2}{3}$, $y = \frac{-4}{6}$, $z = \frac{-7}{9}$

(d) $x = \frac{-1}{5}$, $y = \frac{2}{15}$, $z = \frac{-3}{10}$

111. Use the distributivity of multiplication of rational numbers over addition to simplify

(a) $\frac{3}{5} \times \left[\frac{35}{24} + \frac{10}{1}\right]$ (b) $\frac{-5}{4} \times \left[\frac{8}{5} + \frac{16}{15}\right]$

(c) $\frac{2}{7} \times \left[\frac{7}{16} - \frac{21}{4}\right]$ (d) $\frac{3}{4} \times \left[\frac{8}{9} - 40\right]$

112. Simplify

(a) $\frac{32}{5} + \frac{23}{11} \times \frac{22}{15}$ (b) $\frac{3}{7} \times \frac{28}{15} \div \frac{14}{5}$

(c) $\frac{3}{7} + \frac{-2}{21} \times \frac{-5}{6}$ (d) $\frac{7}{8} + \frac{1}{16} - \frac{1}{12}$

113. Identify the rational number that does not belong with the other three. Explain your reasoning

$$\frac{-5}{11}, \frac{-1}{2}, \frac{-4}{9}, \frac{-7}{3}$$

114. The cost of $\frac{19}{4}$ metres of wire is Rs. $\frac{171}{2}$. Find the cost of one metre of the wire.

115. A train travels $\frac{1445}{2}$ km in $\frac{17}{2}$ hours. Find the speed of the train in km/h.

116. If 16 shirts of equal size can be made out of 24m of cloth, how much cloth is needed for making one shirt?

117. $\frac{7}{11}$ of all the money in Hamid's bank account is Rs. 77,000. How much money does Hamid have in his bank account?

118. A $117\frac{1}{3}$ m long rope is cut into equal pieces measuring $7\frac{1}{3}$ m each. How many such small pieces are these?

119. $\frac{1}{6}$ of the class students are above average, $\frac{1}{4}$ are average and rest are below average. If there are 48 students in all, how many students are below average in the class?

120. $\frac{2}{5}$ of total number of students of a school come by car while $\frac{1}{4}$ of students come by bus to school. All the other students walk to school of which $\frac{1}{3}$ walk on their own and the rest are escorted by their parents. If 224 students come to school walking on their own, how many students study in that school?

121. Huma, Hubna and Seema received a total of Rs. 2,016 as monthly allowance from their mother such that Seema gets $\frac{1}{2}$ of what Huma gets and Hubna gets $1\frac{2}{3}$ times Seema's share. How much money do the three sisters get individually?

122. A mother and her two daughters got a room constructed for Rs. 62,000. The elder daughter contributes $\frac{3}{8}$ of her mother's contribution while the younger daughter contributes $\frac{1}{2}$ of her mother's share. How much do the three contribute individually?

123. Tell which property allows you to compare

$\frac{2}{3}\times\left[\frac{3}{4}\times\frac{5}{7}\right]$ and $\left[\frac{2}{3}\times\frac{5}{7}\right]\times\frac{3}{4}$

124. Name the property used in each of the following.

(i) $-\frac{7}{11}\times\frac{-3}{5}=\frac{-3}{5}\times\frac{-7}{11}$

(ii) $-\frac{2}{3}\times\left[\frac{3}{4}+\frac{-1}{2}\right]=\left[\frac{-2}{3}\times\frac{3}{4}\right]+\left[\frac{-2}{3}\times\frac{-1}{2}\right]$

(iii) $\frac{1}{3}+\left[\frac{4}{9}+\left(\frac{-4}{3}\right)\right]=\left[\frac{1}{3}+\frac{4}{9}\right]+\left[\frac{-4}{3}\right]$

(iv) $\frac{-2}{7}+0=0+\frac{-2}{7}=-\frac{2}{7}$

(v) $\frac{3}{8}\times 1=1\times\frac{3}{8}=\frac{3}{8}$

125. Find the multiplicative inverse of

(i) $-1\frac{1}{8}$ (ii) $3\frac{1}{3}$

126. Arrange the numbers $\frac{1}{4},\frac{13}{16},\frac{5}{8}$ in the descending order.

127. The product of two rational numbers is $\frac{-14}{27}$. If one of the numbers be $\frac{7}{9}$, find the other.

128. By what numbers should we multiply $\frac{-15}{20}$ so that the product may be $\frac{-5}{7}$?

129. By what number should we multiply $\frac{-8}{13}$ so that the product may be 24?

130. The product of two rational numbers is –7. If one of the number is –5, find the other?

131. Can you find a rational number whose multiplicative inverse is –1?

132. Find five rational numbers between 0 and 1.

133. Find two rational numbers whose absolute value is $\frac{1}{5}$.

134. From a rope 40 metres long, pieces of equal size are cut. If the length of one piece is $\frac{10}{3}$ metre, find the number of such pieces.

135. $5\frac{1}{2}$ metres long rope is cut into 12 equal pieces. What is the length of each piece?

136. Write the following rational numbers in the descending order.

$\frac{8}{7}, \frac{-9}{8}, \frac{-3}{2}, 0, \frac{2}{5}$

137. Find (i) $0 \div \frac{2}{3}$ (ii) $\frac{1}{3} \times \frac{-5}{7} \times \frac{-21}{10}$

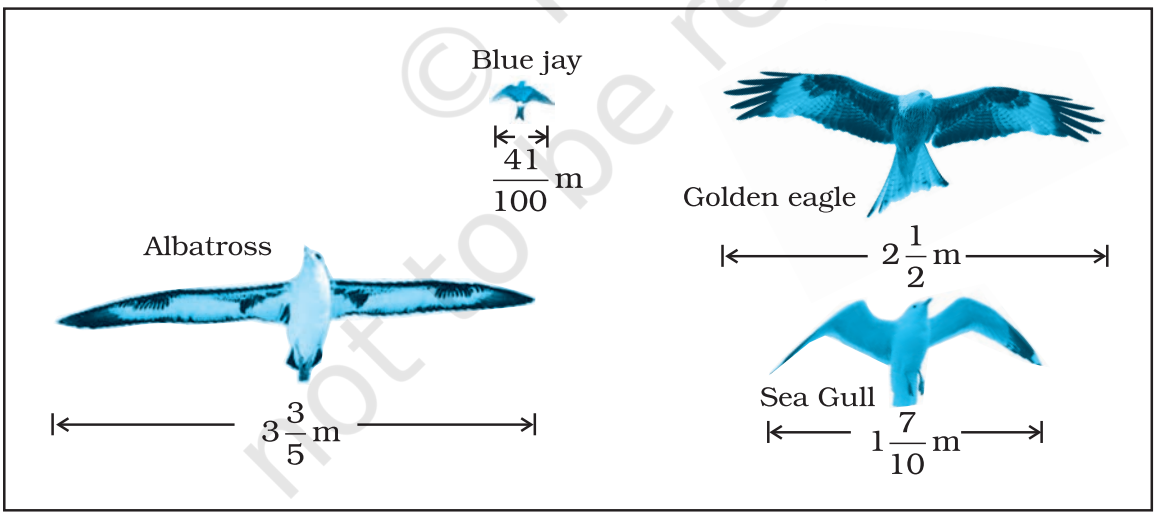
138. On a winter day the temperature at a place in Himachal Pradesh was –16°C. Convert it in degree Fahrenheit (^{0}F) by using the formula.

$\frac{C}{5} = \frac{F-32}{9}$

139. Find the sum of additive inverse and multiplicative inverse of 7.

140. Find the product of additive inverse and multiplicative inverse of $-\frac{1}{3}$.

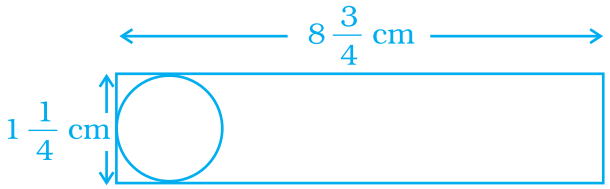
141. The diagram shows the wingspans of different species of birds. Use the diagram to answer the question given below:



(a) How much longer is the wingspan of an Albatross than the wingspan of a Sea gull?

(b) How much longer is the wingspan of a Golden eagle than the wingspan of a Blue jay?

142. Shalini has to cut out circles of diameter $1\frac{1}{4}$ cm from an aluminium strip of dimensions $8\frac{3}{4}$ cm by $1\frac{1}{4}$ cm. How many full circles can Shalini cut? Also calculate the wastage of the aluminium strip.



143. One fruit salad recipe requires $\frac{1}{2}$ cup of sugar. Another recipe for the same fruit salad requires 2 tablespoons of sugar. If 1 tablespoon is equivalent to $\frac{1}{16}$ cup, how much more sugar does the first recipe require?

144. Four friends had a competition to see how far could they hop on one foot. The table given shows the distance covered by each.

Name	**Distance covered (km)**
Seema	$\frac{1}{25}$
Nancy	$\frac{1}{32}$
Megha	$\frac{1}{40}$
Soni	$\frac{1}{20}$

(a) How farther did Soni hop than Nancy?

(b) What is the total distance covered by Seema and Megha?

(c) Who walked farther, Nancy or Megha?

145. The table given below shows the distances, in kilometres, between four villages of a state. To find the distance between two villages,

locate the square where the row for one village and the column for the other village intersect.

	Sonapur	Ramgarh	Himgaon	Rawalpur
Sonapur		$40\frac{2}{3}$	$100\frac{5}{6}$	$16\frac{1}{2}$
Ramgarh	$40\frac{2}{3}$		$210\frac{3}{8}$	$16\frac{2}{3}$
Himgaon	$100\frac{5}{6}$	$210\frac{3}{8}$		$98\frac{3}{4}$
Rawalpur	$16\frac{1}{2}$	$30\frac{2}{3}$	$98\frac{3}{4}$	

(a) Compare the distance between Himgaon and Rawalpur to Sonapur and Ramgarh?

(b) If you drove from Himgaon to Sonapur and then from Sonapur to Rawalpur, how far would you drive?

146. The table shows the portion of some common materials that are recycled.

Material	**Recycled**
Paper	$\frac{5}{11}$
Aluminium cans	$\frac{5}{8}$
Glass	$\frac{2}{5}$
Scrap	$\frac{3}{4}$

(a) Is the rational number expressing the amount of paper recycled more than $\frac{1}{2}$ or less than $\frac{1}{2}$?

(b) Which items have a recycled amount less than $\frac{1}{2}$?

(c) Is the quantity of aluminium cans recycled more (or less) than half of the quantity of aluminium cans?

(d) Arrange the rate of recycling the materials from the greatest to the smallest.

147. The overall width in cm of several wide-screen televisions are 97.28 cm, $98\frac{4}{9}$ cm, $98\frac{1}{25}$ cm and 97.94 cm. Express these numbers as rational numbers in the form $\frac{p}{q}$ and arrange the widths in ascending order.

148. Roller Coaster at an amusement park is $\frac{2}{3}$ m high. If a new roller coaster is built that is $\frac{3}{5}$ times the height of the existing coaster, what will be the height of the new roller coaster?

149. Here is a table which gives the information about the total rainfall for several months compared to the average monthly rains of a town. Write each decimal in the form of rational number $\frac{p}{q}$.

Month	Above/Below normal (in cm)
May	2.6924
June	0.6096
July	– 6.9088
August	– 8.636

150. The average life expectancies of males for several states are shown in the table. Express each decimal in the form $\frac{p}{q}$ and arrange the states from the least to the greatest male life expectancy.

State-wise data are included below; more indicators can be found in the "FACTFILE" section on the homepage for each state.

State	Male	$\frac{p}{q}$ form	Lowest terms
Andhra Pradesh	61.6		
Assam	57.1		
Bihar	60.7		
Gujarat	61.9		
Haryana	64.1		
Himachal Pradesh	65.1		
Karnataka	62.4		
Kerala	70.6		
Madhya Pradesh	56.5		
Maharashtra	64.5		
Orissa	57.6		
Punjab	66.9		
Rajasthan	59.8		
Tamil Nadu	63.7		
Uttar Pradesh	58.9		
West Bengal	62.8		
India	60.8		

Source: Registrar General of India (2003) SRS Based Abridged Lefe Tables. SRS Analytical Studies, Report No. 3 of 2003, New Delhi: Registrar General of India. The data are for the 1995-99 period; states subsequently divided are therefore included in their pre-partition states (Chhatisgarh in MP, Uttaranchal in UP and Jharkhand in Bihar)

151. A skirt that is $35\frac{7}{8}$ cm long has a hem of $3\frac{1}{8}$ cm. How long will the skirt be if the hem is let down?

152. Manavi and Kuber each receives an equal allowance. The table shows the fraction of their allowance each deposits into his/her saving account and the fraction each spends at the mall. If allowance of each is Rs. 1260 find the amount left with each.

Where money goes	Fraction of allowance	
	Manavi	Kuber
Saving Account	$\frac{1}{2}$	$\frac{1}{3}$
Spend at mall	$\frac{1}{4}$	$\frac{3}{5}$
Left over	?	?

(D) Games and Puzzles

1. Given below is a magic square. Place the numbers $\frac{70}{95}, \frac{-21}{-133}, \frac{25}{95}, \frac{24}{38}$ in the appropriate squares so that sum in each row, column and diagonal is equal.

$\frac{32}{38}$	$\frac{18}{38}$	$\frac{4}{38}$	$\frac{-14}{-38}$
$\frac{-18}{-57}$	?	?	$\frac{104}{152}$
$\frac{22}{38}$	?	?	$\frac{-20}{-95}$
$\frac{1}{19}$	$\frac{-16}{-38}$	$\frac{45}{57}$	$\frac{60}{114}$

Hint: (Rewrite each rational number in its lowest term.)

2. Solve the given crossword filling up the given boxes. Clues are given below for across as well as downward filling. Also, for across and down clues, clue number is written at the corner of the boxes. Answers of clues have to be filled in their respective boxes.

Down 1: $\frac{2}{3}$ and $\frac{-5}{4}$ are _____ numbers.

Down 2: The _____ inverse of $\frac{a}{b}$ is $\frac{-a}{b}$.

Down 3: The addition and multiplication of whole number integers and rational numbers is _____.

Down 4: Since $\frac{1}{0}$ doesn't exist hence 0 has no _____.

Down 5: The number line extends _____ on both the sides.

Down 6: The _____ of two integers may not lead to the formation of another integer.

Down 7: The multiplication of a number by its reciprocal gives_____.

Down 8: Rational numbers can be represented on a _____ line.

Across 1: There are _____ rational numbers between two integers.

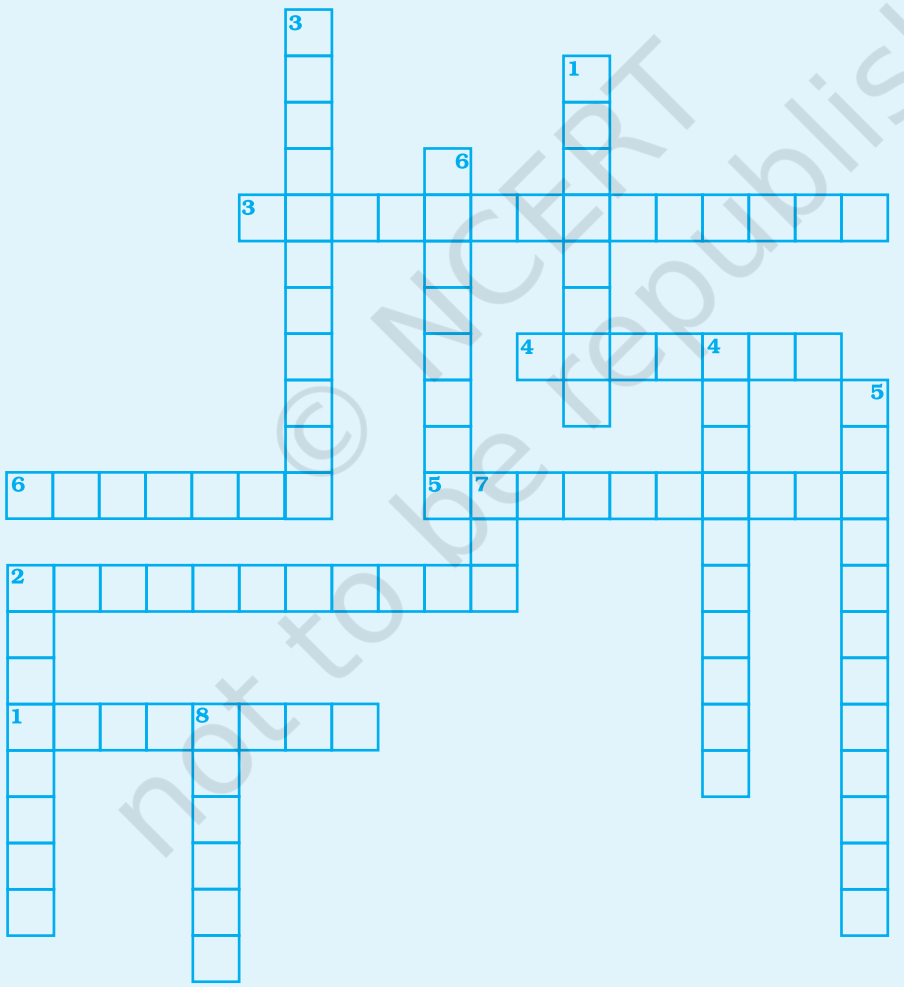
Across 2: The multiplication of rational numbers is commutative and _____.

Across 3: The addition and _____ of two rational numbers lead to the formation of another rational number.

Across 4: All the positive integers excluding 0 are known as _____ numbers.

Across 5: For any rational a ; $a \div 0$ is _____.

Across 6: Reciprocal is also known as the multiplicative _____.

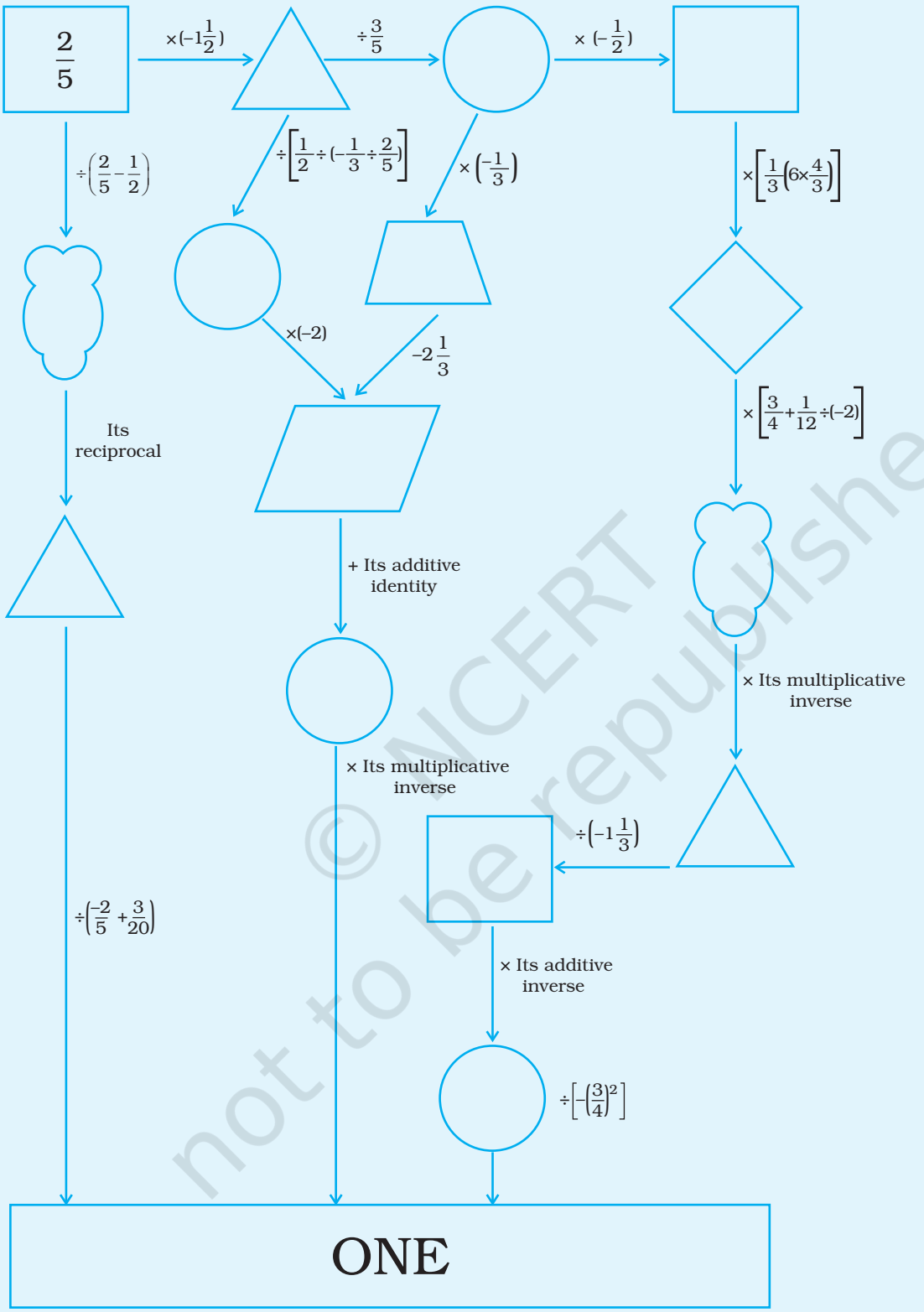


3. Break the Code

Solve this riddle by reducing each rational number to its lowest term. The magnitude of the numerator of rational number so obtained gives you the letter you have to encircle in the word following it. Use the encircled letters to fill in the blanks given below:

S.No.	Rational Number	Lowest Term	Word
(1)	$\frac{-12}{30}$		SPIN
(2)	$\frac{-24}{-36}$		TYPE
(3)	$\frac{39}{52}$		WITH
(4)	$\frac{-48}{144}$		HOST
(5)	$\frac{27}{90}$		SHARP
(6)	$\frac{-34}{-170}$		GAIN
(7)	$\frac{76}{95}$		PROOF
(8)	$\frac{46}{-92}$		RAIN
(9)	$\frac{29}{116}$		AWAY
(10)	$\frac{14}{-42}$		SWEET

____	____	____	____	____	____	____	____	____	____
1	2	3	4	5	6	7	8	9	10



Rough Work

UNIT 2

DATA HANDLING

(A) Main Concepts and Results

- The information collected in term of numbers is called **data**.
- Data are represented graphically to have a quick glance on them.
- Data available in an unorganised form are called **raw data**.
- The number of times a particular observation occurs in a given data is called its **frequency.**
- When the data are large, they can be arranged in groups and each group is known as **Class Interval or Class.**
- A table showing the frequencies of various observations or class intervals of a given data is called a **Frequency Distribution table.**
- The *upper value* of a class interval is called its **Upper Class Limit** and the *lower value* of the class interval is called its **Lower Class Limit**.
- The difference between the upper class limit and lower class limit of a class is called the **Width or Size** of the class.
- The difference between the lowest and the highest observation in a given data is called its **Range**.
- Grouped data can be represented by a **histogram**.
- Histogram is a type of bar diagram, where the class intervals are shown on the horizontal axis and the heights of the bars (rectangles) show the frequency of the class interval, but there is no gap between the bars as there is no gap between the class intervals.
- Data can also be represented using a **pie chart** (circle graph). It shows the relationship between a whole and its parts.

- There are certain experiments whose outcomes have an equal chance of occurring. Such outcomes are said to be **equally likely.**
- Probability of an event =

$$\frac{\text{Number of outcomes that make an event}}{\text{Total number of outcomes of the experiment}},$$

when the outcomes are equally likely.

(B) Solved Examples

In examples 1 to 6, there are four options given out of which one is correct. Choose the correct answer.

Example 1 : The range of the data– 9, 8, 4, 3, 2, 1, 6, 4, 8, 10, 12, 15, 4, 3 is

(a) 15 (b) 14 (c) 12 (d) 10

Solution : The correct answer is (b).

Example 2 : The following data : 2, 5, 15, 25, 20, 12, 8, 7, 6, 16, 21, 17, 30, 32, 23, 40, 51, 15, 2, 9, 57, 19, 25 is grouped in the classes 0 –5, 5 –10, 10 –15 etc. Find the frequency of the class 20 –25.

(a) 5 (b) 4 (c) 3 (d) 2

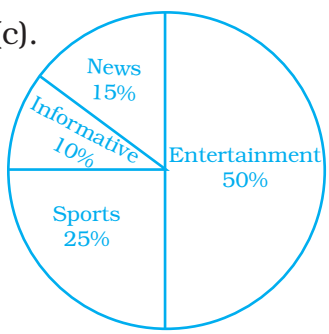
Solution : The correct answer is (c).

Example 3 : The pie chart depicts the information of viewers watching different type of channels on TV. Which type of programmes are viewed the most?

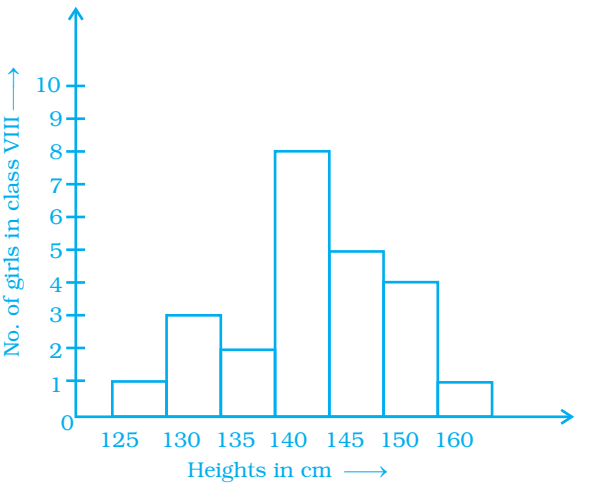
(a) News (b) Sports (c) Entertainment

(d) Informative.

Solution : The correct answer is (c).



Example 4 :



Observe the histogram given above. The number of girls having height 145 cm and above is

(a) 5 (b) 10 (c) 17 (d) 19

Solution : The correct answer is (b).

Example 5 : A dice is thrown two times and sum of the numbers appearing on the dice are noted. The number of possible outcomes is

(a) 6 (b) 11 (c) 18 (d) 36

Solution : The correct answer is (b).

[Possible sums are 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12].

Example 6 : The probability of getting a multiple of 2 when a dice is rolled is

(a) $\frac{1}{6}$ (b) $\frac{1}{3}$ (c) $\frac{1}{2}$ (d) $\frac{2}{3}$

Solution : The correct answer is (c).

In examples 7 to 9 fill in the blanks to make statements true.

Example 7 : The fourth class interval for a grouped data whose first and second class intervals are 10 –15 and 15 –20 respectively is _____.

Solution : 25 – 30

Example 8 : In the class interval 250 – 275, 250 is known as the _____.

Solution : Lower class limit.

Example 9 : The number of times a particular observation occurs in the given data is called its _____.

Solution : Frequency.

In examples 10 to 12, state whether the statements are true (T) or false (F).

Example 10 : The central angle of the sectors in a pie chart will be a fraction of 360°.

Solution : True.

Example 11 : On throwing a dice, the probability of occurrence of an odd number is $\frac{1}{2}$.

Solution : True.

Example 12 : A pie chart is also called a pictograph.

Solution : False .

Example 13 : The weekly wages (in Rs.) of 30 workers in a factory are 830, 835, 890, 810, 835, 836, 869, 845, 898, 890, 820, 860, 832, 833, 855, 845, 804, 808, 812, 840, 885, 835, 835, 836, 878, 840, 868, 890, 806, 840.

Using tally marks, make a frequency distribution table with class intervals 800 – 810, 810 – 820 and so on.

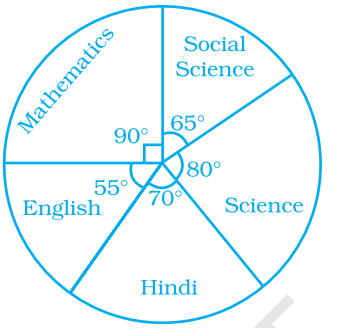
Solution :

Class interval	Tally marks	Frequency
800 – 810	III	3
810 – 820	II	2
820 – 830	I	1
830 – 840	𝍸 IIII	9
840 – 850	𝍸	5
850 – 860	I	1
860 – 870	III	3
870 – 880	I	1
880 – 890	I	1
890 – 900	IIII	4
	Total	**30**

Example 14 : The pie chart gives the marks scored in an examination by a student in different subjects. If the total marks obtained were 540, answer the following questions–

(i) In which subject did the student score 105 marks?

(ii) How many more marks were obtained by the student in Mathematics than in Hindi?



Solution : (i) For 540 marks, central angle = 360°

For 1 mark, central angle = $\frac{360°}{540}$

For 105 marks, central angle = $\frac{360°}{540} \times 105$

= 70°

Hence the student scored 105 marks in Hindi.

(ii) Central angle = 360° for 540 marks,

For 1 mark, central angle = $\frac{360°}{540}$

For 90 marks, central angle = $\frac{540}{360} \times 90$ marks

= 135 marks.

Thus, the student gets 135 marks in Mathematics. From part (i) we get that the student gets 105 marks in Hindi.

Difference in marks = 135 – 105 = 30

Hence, the student gets 30 more marks in Mathematics than in Hindi.

Example 15 : Draw a pie chart for the given data.

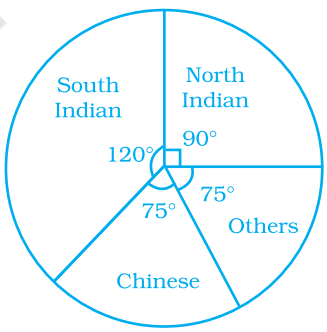
Favourite food	Number of people
North Indian	30
South Indian	40
Chinese	25
Others	25

Solution : Total number of people = 120

We find the central angle for each sector.

Favourite food	Number of people	In fraction	Central angle
North Indian	30	$\frac{30}{120}=\frac{1}{4}$	$\frac{1}{4}\times 360°=90°$
South Indian	40	$\frac{40}{120}=\frac{1}{3}$	$\frac{1}{3}\times 360°=120°$
Chinese	25	$\frac{25}{120}=\frac{5}{24}$	$\frac{5}{24}\times 360°=75°$
Others	25	$\frac{25}{120}=\frac{5}{24}$	$\frac{5}{24}\times 360°=75°$

The pie chart is drawn adjacently.



Try to write a formula for the probability of finding a paper.

Data can be represented in several different ways, depending on the type of data and the message to be conveyed.

Type of Graph	
Line graph	Shows change in data over time.
Bar graph	Shows relationship or comparisons between groups.
Cricle graph	Compares parts to a whole.
Histogram	Shows the frequency of data divided into equal groups.

Example 16 : Draw a histogram for the frequency distribution table given in Example 13 and answer the following questions.

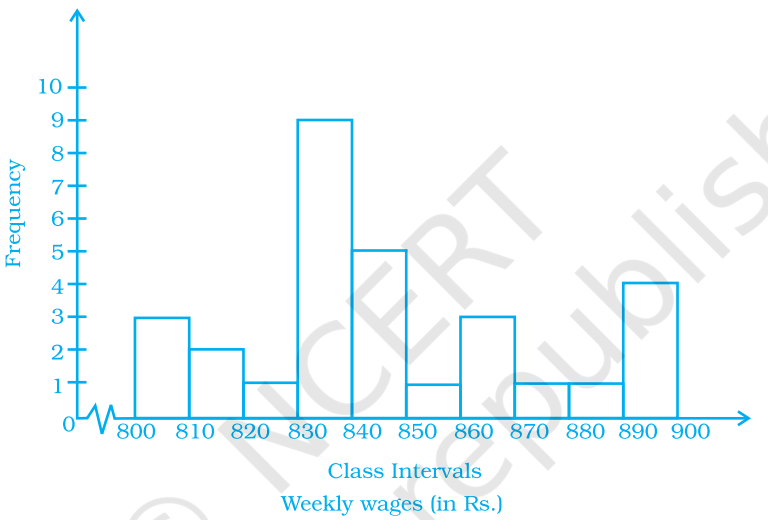
(i) Which class interval has the maximum number of workers?

(ii) How many workers earn Rs. 850 and more?

(iii) How many workers earn less than Rs. 850?

(iv) How many workers earn Rs. 820 or more but less than Rs. 880?

Solution :



(i) 830 – 840

(ii) 10

(iii) 20

(iv) 20

Example 17 : Read the frequency distribution table given below and answer the questions that follow:

Class Interval	Frequency
25 – 35	1
35 – 45	5
45 – 55	5
55 – 65	4
65 – 75	0
75 – 85	8
85 – 95	2
Total	**25**

(i) Class interval which has the lowest frequency.

(ii) Class interval which has the highest frequency.

(iii) What is the class size of the intervals?

(iv) What is the upper limit of the fifth class?

(v) What is the lower limit of the last class?

Solution : (i) 65 – 75

(ii) 75 – 85

(iii) 10

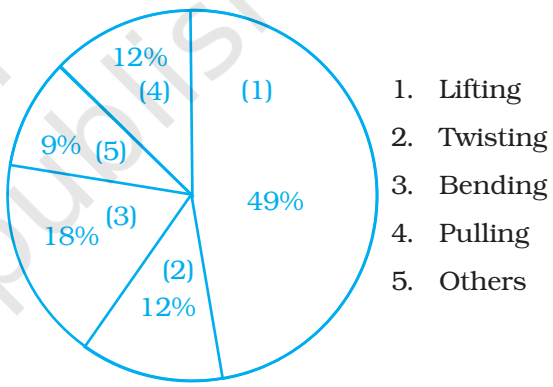
(iv) 75

(v) 85

Example 18 : Application on problem solving strategy

Given below is a pie chart depicting the reason given by people who had injured their lower back.

Study the pie chart and find the number of people who injured their back while either bending and lifting. A total of 600 people were surveyed.



Solution : **Understand and explore the problem**

- What information is given in the question?

  The percentages of the most common reasons given by 600 people.
- What are you trying to find?

  The total number of people out of 600 who have injured their back while bending and lifting.
- Is there any information that is not needed?

  The percentages of other reasons except bending and lifting are not required.

Plan a strategy

- You have learnt to solve questions dealing with percentages in earlier classes. Use the same method to solve this question.

- 18% have injured their back while bending and 49% have injured their back while lifting so–

To find

The total number of people can be found by finding (18% + 49%) = 67% of 600.

Solve

Total percentage of people who injured their back while bending and lifting = 18% +49% = 67%.

Number of people who injured their back while bending and lifting = 67% of 600

$$= \frac{67}{100} \times 600$$

$$= 402$$

Hence, 402 people injured their back while bending and lifting.

Revise

You can check the answer by finding the total number of people who injured their backs for reasons other than bending and lifting and then subtracting the answer from the total number of people.

Total percentage of people who injured their backs for reasons other than bending and lifting = 12% +12% + 9%

$$= 33\%$$

Number of such people = 33% of 600 $= \frac{33}{100} \times 600$

$$= 198$$

So, 600 –198 should give us the answer for our original question, and 600 –198 = 402 which is same as our answer. Hence our answer is correct.

Think and Discuss

(i) If the total angle covered by all sectors is 360^0, find the angle covered by the sector representing the people who injured their back by pulling only.

(ii) If the number of people surveyed is doubled, would the number of people who injured their back by bending and lifting also be doubled?

(C) Exercise

In questions 1 to 35 there are four options given, out of which one is correct. Choose the correct answer.

1. The height of a rectangle in a histogram shows the

(a) Width of the class (b) Upper limit of the class

(c) Lower limit of the class (d) Frequency of the class

2. A geometric representation showing the relationship between a whole and its parts is a

(a) Pie chart (b) Histogram (c) Bar graph (d) Pictograph

3. In a pie chart, the total angle at the centre of the circle is

(a) 180° (b) 360° (c) 270° (d) 90°

4. The range of the data 30, 61, 55, 56, 60, 20, 26, 46, 28, 56 is

(a) 26 (b) 30 (c) 41 (d) 61

5. Which of the following is not a random experiment?

(a) Tossing a coin (b) Rolling a dice

(c) Choosing a card from a deck of 52 cards

(d) Thowing a stone from a roof of a building

6. What is the probability of choosing a vowel from the alphabets?

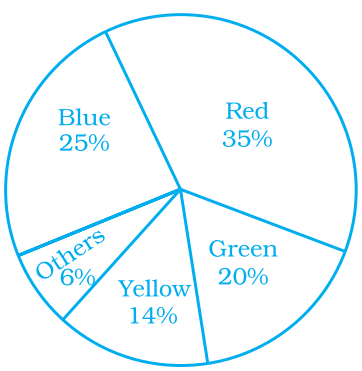
(a) $\frac{21}{26}$ (b) $\frac{5}{26}$ (c) $\frac{1}{26}$ (d) $\frac{3}{26}$

7. In a school only, 3 out of 5 students can participate in a competition. What is the probability of the students who do not make it to the competition?

(a) 0.65 (b) 0.4 (c) 0.45 (d) 0.6

Students of a class voted for their favourite colour and a pie chart was prepared based on the data collected.

Observe the pie chart given below and answer questions 8 –10 based on it.



8. Which colour received $\frac{1}{5}$ of the votes?

(a) Red (b) Blue (c) Green

(d) Yellow

9. If 400 students voted in all, then how many did vote 'Others' colour as their favourite?

(a) 6 (b) 20 (c) 24 (d) 40

10. Which of the following is a reasonable conclusion for the given data?

(a) $\frac{1}{20}$th student voted for blue colour

(b) Green is the least popular colour

(c) The number of students who voted for red colour is two times the number of students who voted for yellow colour

(d) Number of students liking together yellow and green colour is approximately the same as those for red colour.

11. Listed below are the temperature in °C for 10 days.

–6, –8, 0, 3, 2, 0, 1, 5, 4, 4

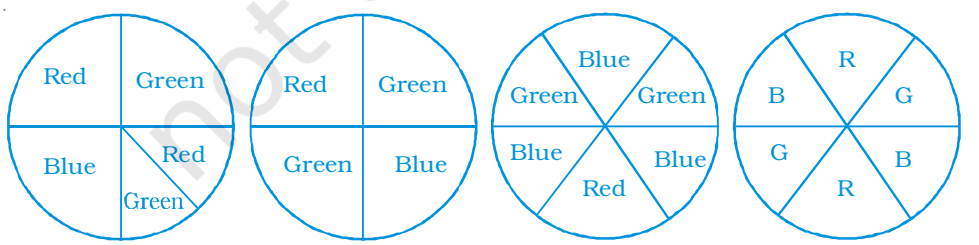
What is the range of the data?

(a) 8 (b) 13°C (c) 10°C (d) 12°C

12. Ram put some buttons on the table. There were 4 blue, 7 red, 3 black and 6 white buttons in all. All of a sudden, a cat jumped on the table and knocked out one button on the floor. What is the probability that the button on the floor is blue?

(a) $\frac{7}{20}$ (b) $\frac{3}{5}$ (c) $\frac{1}{5}$ (d) $\frac{1}{4}$

13. Rahul, Varun and Yash are playing a game of spinning a coloured wheel. Rahul wins if spinner lands on red. Varun wins if spinner lands on blue and Yash wins if it lands on green. Which of the following spinner should be used to make the game fair?



(i) (ii) (iii) (iv)

(a) (i) (b) (ii) (c) (iii) (d) (iv)

14. In a frequency distribution with classes 0 –10, 10 –20 etc., the size of the class intervals is 10. The lower limit of fourth class is

(a) 40 (b) 50 (c) 20 (d) 30

15. A coin is tossed 200 times and head appeared 120 times. The probability of getting a head in this experiment is

(a) $\frac{2}{5}$ (b) $\frac{3}{5}$ (c) $\frac{1}{5}$ (d) $\frac{4}{5}$

16. Data collected in a survey shows that 40% of the buyers are interested in buying a particular brand of toothpaste. The central angle of the sector of the pie chart representing this information is

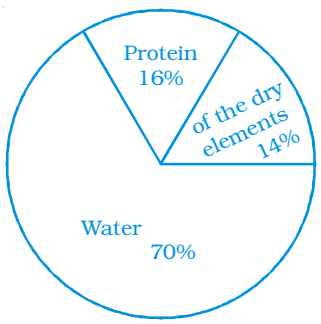
(a) 120° (b) 150° (c) 144° (d) 40°

17. Monthly salary of a person is Rs. 15000. The central angle of the sector representing his expenses on food and house rent on a pie chart is 60°. The amount he spends on food and house rent is

(a) Rs. 5000 (b) Rs. 2500 (c) Rs. 6000 (d) Rs. 9000

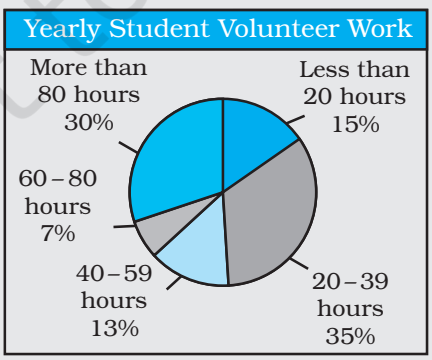
18. The following pie chart gives the distribution of constituents in the human body. The central angle of the sector showing the distribution of protein and other constituents is

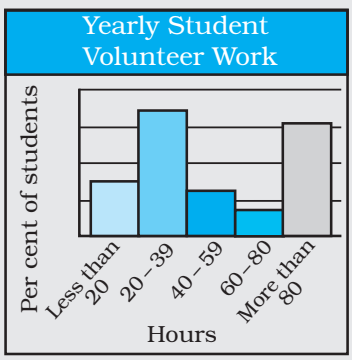
(a) 108° (b) 54° (c) 30° (d) 216°



Selecting a Data Display

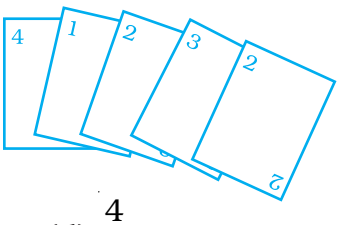
Which graph is a better display of the data on students volunteering for some work?





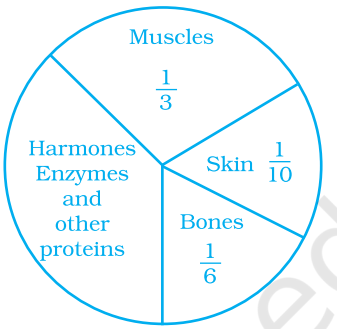
The data shows how groups of people who responded to the survey compare to the whole. The circle graph is the better representation.

19. Rohan and Shalu are playing with 5 cards as shown in the figure. What is the probability of Rohan picking a card without seeing, that has the number 2 on it?



(a) $\frac{2}{5}$ (b) $\frac{1}{5}$ (c) $\frac{3}{5}$ (d) $\frac{4}{5}$

20. The following pie chart represents the distribution of proteins in parts of a human body. What is the ratio of distribution of proteins in the muscles to that of proteins in the bones?



(a) 3 : 1 (b) 1 : 2 (c) 1 : 3 (d) 2 : 1

21. What is the central angle of the sector (in the above pie chart) representing skin and bones together?

(a) 36° (b) 60° (c) 90° (d) 96°

22. What is the central angle of the sector (in the above pie chart) representing hormones enzymes and other proteins.

(a) 120° (b) 144° (c) 156° (d) 176°

23. A coin is tossed 12 times and the outcomes are observed as shown below:

The chance of occurrence of Head is

(a) $\frac{1}{2}$ (b) $\frac{5}{12}$ (c) $\frac{7}{12}$ (d) $\frac{5}{7}$

24. Total number of outcomes, when a ball is drawn from a bag which contains 3 red, 5 black and 4 blue balls is

(a) 8 (b) 7 (c) 9 (d) 12

25. A graph showing two sets of data simultaneously is known as

(a) Pictograph (b) Histogram (c) Pie chart (d) Double bar graph

26. Size of the class 150 –175 is

(a) 150 (b) 175 (c) 25 (d) –25

27. In a throw of a dice, the probability of getting the number 7 is

(a) $\frac{1}{2}$ (b) $\frac{1}{6}$ (c) 1 (d) 0

28. Data represented using circles is known as

(a)Bar graph (b) Histogram (c) Pictograph (d) Pie chart

29. Tally marks are used to find

(a) Class intervals (b) Range

(c) Frequency (d) Upper limit

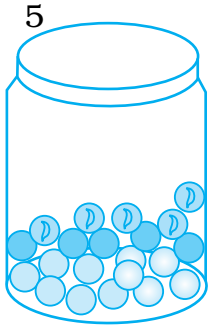
30. Upper limit of class interval 75 –85 is

(a) 10 (b) –10 (c) 75 (d) 85

31. Numbers 1 to 5 are written on separate slips, i.e one number on one slip and put in a box. Wahida pick a slip from the box without looking at it. What is the probability that the slip bears an odd number?

(a) $\frac{1}{5}$ (b) $\frac{2}{5}$ (c) $\frac{3}{5}$ (d) $\frac{4}{5}$

32. A glass jar contains 6 red, 5 green, 4 blue and 5 yellow marbles of same size. Hari takes out a marble from the jar at random. What is the probability that the chosen marble is of red colour?



(a) $\frac{7}{10}$ (b) $\frac{3}{10}$ (c) $\frac{4}{5}$ (d) $\frac{2}{5}$

33. A coin is tossed two times. The number of possible outcomes is

(a) 1 (b) 2 (c) 3 (d) 4

34. A coin is tossed three times. The number of possible outcomes is

(a) 3 (b) 4 (c) 6 (d) 8

35. A diece is tossed two times. The number of possible outcomes is

(a) 12 (b) 24 (c) 36 (d) 30

In questions 36 to 58, fill in the blanks to make the statements true.

36. Data available in an unorganised form is called _____ data.

37. In the class interval 20 – 30, the lower class limit is _____.

38. In the class interval 26 – 33, 33 is known as _____.

39. The range of the data 6, 8, 16, 22, 8, 20, 7, 25 is _____.

40. A pie chart is used to compare _____ to a whole.

41. In the experiment of tossing a coin one time, the outcome is either _____ or _____.

42. When a dice is rolled, the six possible outcomes are _____.

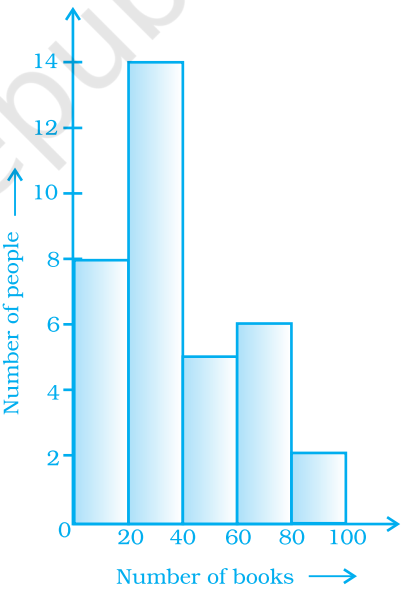
43. Each outcome or a collection of outcomes in an experiment makes an _____.

44. An experiment whose outcomes cannot be predicted exactly in advance is called a _____ experiment.

45. The difference between the upper and lower limit of a class interval is called the _____ of the class interval.

46. The sixth class interval for a grouped data whose first two class intervals are 10 – 15 and 15 – 20 is _____.

Histogram given on the right shows the number of people owning the different number of books. Answer 47 to 50 based on it.



47. The total number of people surveyed is _____.

48. The number of people owning books more than 60 is _____.

49. The number of people owning books less than 40 is _____.

50. The number of people having books more than 20 and less than 40 is _____.

51. The number of times a particular observation occurs in a given data is called its _____.

52. When the number of observations is large, the observations are usually organised in groups of equal width called _____.

53. The total number of outcomes when a coin is tossed is _____.

54. The class size of the interval 80 – 85 is _____.

55. In a histogram _____ are drawn with width equal to a class interval without leaving any gap in between.

56. When a dice is thrown, outcomes 1, 2, 3, 4, 5, 6 are equally _____.

57. In a histogram, class intervals and frequencies are taken along _____ axis and _____ axis.

58. In the class intervals 10 –20, 20 –30, etc., respectively, 20 lies in the class _____.

In questions 59 to 81, state whether the statements are true (T) or false (F).

59. In a pie chart a whole circle is divided into sectors.

60. The central angle of a sector in a pie chart cannot be more than 180°.

61. Sum of all the central angles in a pie chart is 360°.

62. In a pie chart two central angles can be of 180°.

63. In a pie chart two or more central angles can be equal.

64. Getting a prime number on throwing a die is an event.

Using the following frequency table, answer question 65-68

Marks (obtained out of 10)	4	5	7	8	9	10
Frequency	5	10	8	6	12	9

65. 9 students got full marks.

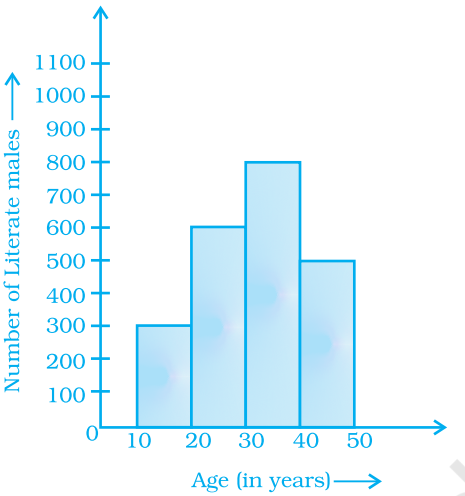
66. The frequency of less than 8 marks is 29.

67. The frequency of more than 8 marks is 21.

68. 10 marks the highest frequency.

69. If the fifth class interval is 60 – 65, fourth class interval is 55 – 60, then the first class interval is 45 –50.

70. From the histogram given on the right, we can say that 1500 males above the age of 20 are literate.



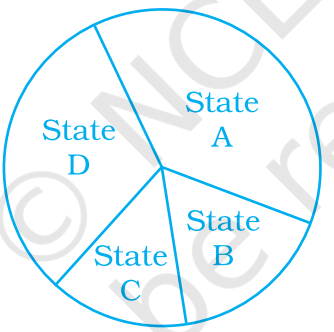
71. The class size of the class interval 60 – 68 is 8.

72. If a pair of coins is tossed, then the number of outcomes are 2.

73. On throwing a dice once, the probability of occurence of an even number is $\frac{1}{2}$.

74. On throwing a dice once, the probability of occurence of a composite number is $\frac{1}{2}$.

75. From the given pie chart, we can infer that production of Manganese is least in state B.



Production of Manganese in 4 different states

76. One or more outcomes of an experiment make an event.

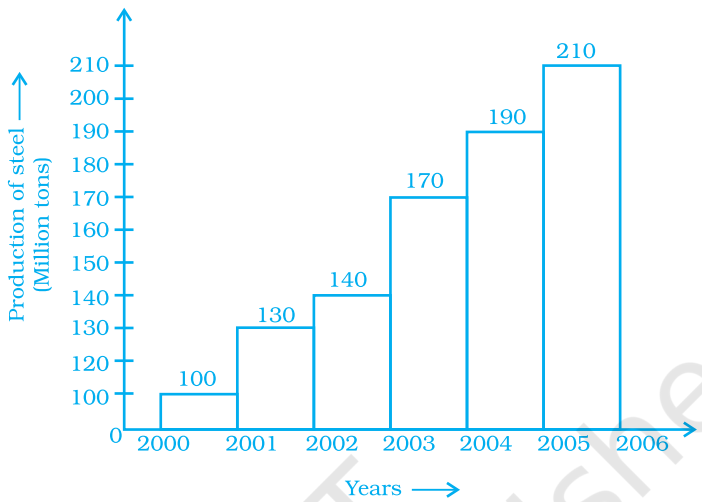
77. The probability of getting number 6 in a throw of a dice is $\frac{1}{6}$. Similarly the probability of getting a number 5 is $\frac{1}{5}$.

78. The probability of getting a prime number is the same as that of a composite number in a throw of a dice.

79. In a throw of a dice, the probability of getting an even number is the same as that of getting an odd number.

80. To verify pythagoras theorem is a random experiment.

81. The following pictorial representation of data is a histogram.



82. Given below is a frequency distribution table. Read it and answer the questions that follow:

Class Interval	Frequency
10 – 20	5
20 – 30	10
30 – 40	4
40 – 50	15
50 – 60	12

(a) What is the lower limit of the second class interval?

(b) What is the upper limit of the last class interval?

(c) What is the frequency of the third class?

(d) Which interval has a frequency of 10?

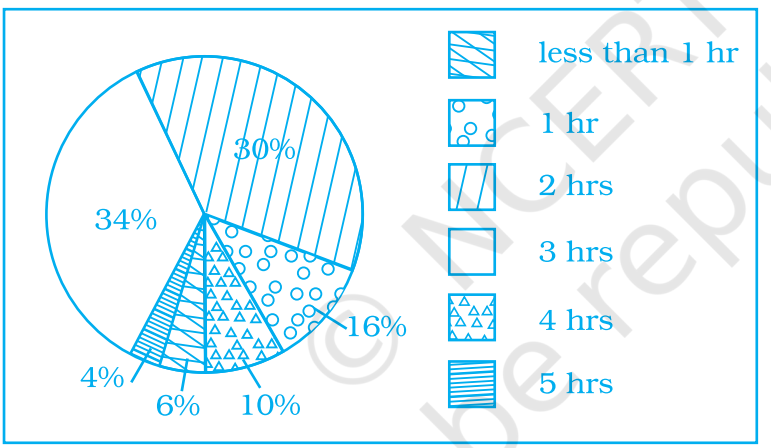
(e) Which interval has the lowest frequency?

(f) What is the class size?

83. The top speeds of thirty different land animals have been organised into a frequency table. Draw a histogram for the given data.

Maximum Speed (km/h)	Frequency
10 – 20	5
20 – 30	5
30 – 40	10
40 – 50	8
50 – 60	0
60 – 70	2

84. Given below is a pie chart showing the time spend by a group of 350 children in different games. Observe it and answer the questions thatfollow.



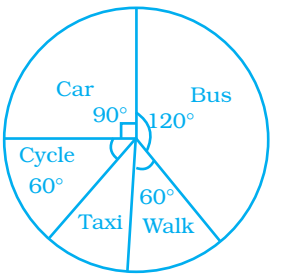
(a) How many children spend at least one hour in playing games?

(b) How many children spend more than 2 hours in playing games?

(c) How many children spend 3 or lesser hours in playing games?

(d) Which is greater — number of children who spend 2 hours or more per day or number of children who play for less than one hour?

85. The pie chart on the right shows the result of a survey carried out to find the modes of travel used by the children to go to school. Study the pie chart and answer the questions that follow.



(a) What is the most common mode of transport?

(b) What fraction of children travel by car?

(c) If 18 children travel by car, how many children took part in the survey?

(d) How many children use taxi to travel to school?

(e) By which two modes of transport are equal number of children travelling?

86. A dice is rolled once. What is the probability that the number on top will be

(a) Odd

(b) Greater than 5

(c) A multiple of 3

(d) Less than 1

(e) A factor of 36

(f) A factor of 6

87. Classify the following statements under appropriate headings.

(a) Getting the sum of angles of a triangle as 180°.

(b) India winning a cricket match against Pakistan.

(c) Sun setting in the evening.

(d) Getting 7 when a die is thrown.

(e) Sun rising from the west.

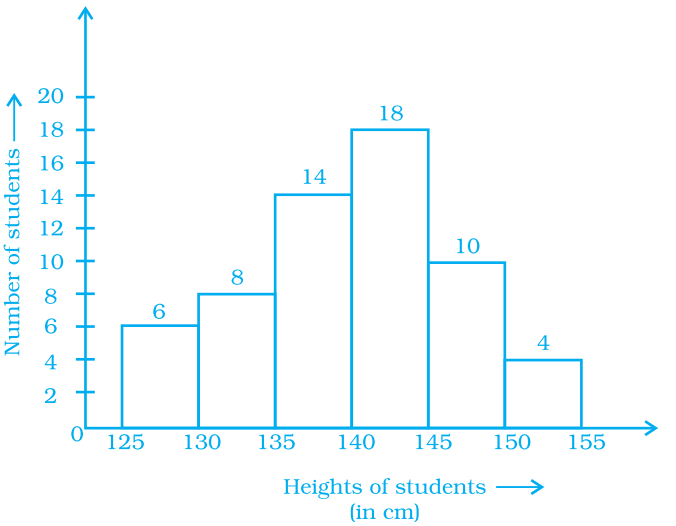
(f) Winning a racing competition by you.

Certain to happen	Impossible to happen	May or may not happen

88. Study the pie chart given below depicting the marks scored by a student in an examination out of 540. Find the marks obtained by him in each subject.

89. Ritwik draws a ball from a bag that contains white and yellow balls. The probability of choosing a white ball is $\frac{2}{9}$. If the total number of balls in the bag is 36, find the number of yellow balls.

90. Look at the histogram below and answer the questions that follow.



(a) How many students have height more than or equal to 135 cm but less than 150 cm?

(b) Which class interval has the least number of students?

(c) What is the class size?

(d) How many students have height less than 140 cm?

91. Following are the number of members in 25 families of a village:

6, 8, 7, 7, 6, 5, 3, 2, 5, 6, 8, 7, 7, 4, 3, 6, 6, 6, 7, 5, 4, 3, 3, 2, 5.

Prepare a frequency distribution table for the data using class intervals 0 –2, 2 –4, etc.

92. Draw a histogram to represent the frequency distribution in question 91.

93. The marks obtained (out of 20) by 30 students of a class in a test are as follows:

14, 16, 15, 11, 15, 14, 13, 16, 8, 10, 7, 11, 18, 15, 14, 19, 20, 7, 10, 13, 12, 14, 15, 13, 16, 17, 14, 11, 10, 20.

Prepare a frequency distribution table for the above data using class intervals of equal width in which one class interval is 4 –8 (excluding 8 and including 4).

94. Prepare a histogram from the frequency distribution table obtained in question 93.

95. The weights (in kg) of 30 students of a class are:

39, 38, 36, 38, 40, 42, 43, 44, 33, 33, 31, 45, 46, 38, 37, 31, 30, 39, 41, 41, 46, 36, 35, 34, 39, 43, 32, 37, 29, 26.

Prepare a frequency distribution table using one class interval as (30 – 35), 35 not included.

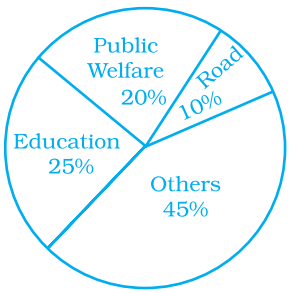
(i) Which class has the least frequency?

(ii) Which class has the maximum frequency?

96. Shoes of the following brands are sold in Nov. 2007 at a shoe store. Construct a pie chart for the data.

Brand	Number of pair of shoes sold
A	130
B	120
C	90
D	40
E	20

97. The following pie chart depicts the expenditure of a state government under different heads.



(i) If the total spending is 10 crores, how much money was spent on roads?

(ii) How many times is the amount of money spent on education compared to the amount spent on roads?

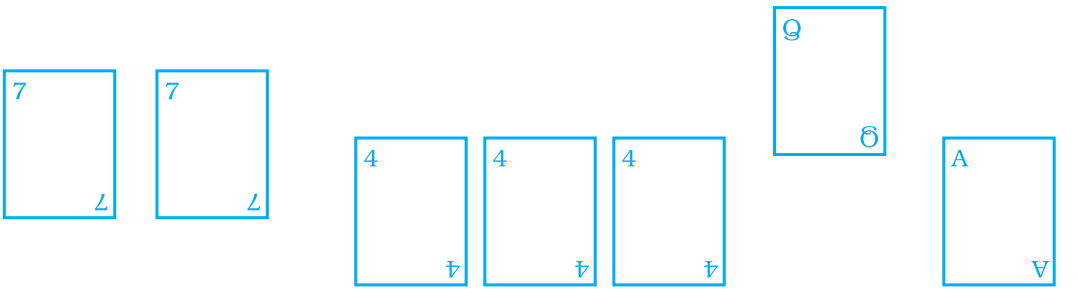
(iii) What fraction of the total expenditure is spent on both roads and public welfare together?

98. The following data represents the different number of animals in a zoo. Prepare a pie chart for the given data.

Animals	Number of animals
Deer	42
Elephant	15
Giraffe	26
Reptiles	24
Tiger	13

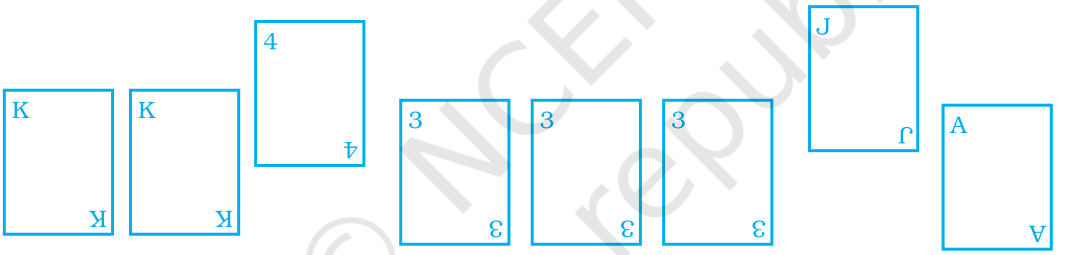
99. Playing cards

(a) From a pack of cards the following cards are kept face down:



Suhail wins if he picks up a face card. Find the probability of Suhail winning?

(b) Now the following cards are added to the above cards:



What is the probability of Suhail winning now? Reshma wins if she picks up a 4. What is the probability of Reshma winning?

[Queen, King and Jack cards are called face cards.]

100. Construct a frequency distribution table for the following weights (in grams) of 35 mangoes, using the equal class intervals, one of them is 40 – 45 (45 not included).

30, 40, 45, 32, 43, 50, 55, 62, 70, 70, 61, 62, 53, 52, 50, 42, 35, 37, 53, 55, 65, 70, 73, 74, 45, 46, 58, 59, 60, 62, 74, 34, 35, 70, 68.

(a) How many classes are there in the frequency distribution table?

(b) Which weight group has the highest frequency?

101. Complete the following table:

Weights (in kg.)	Tally Marks	Frequency (Number of persons)
40 – 50	𝍸 𝍸 ||	
50 – 60	𝍸 𝍸 ||||	
60 – 70	𝍸 |	
70 – 80	||	
80 – 90	|	

Find the total number of persons whose weights are given in the above table.

102. Draw a histogram for the following data.

Class interval	10–15	15–20	20–25	25–30	30–35	35–40
Frequency	30	98	80	58	29	50

103. In a hypothetical sample of 20 people, the amount of money (in thousands of rupees) with each was found to be as follows:

114, 108, 100, 98, 101, 109, 117, 119, 126, 131, 136, 143, 156, 169, 182, 195, 207, 219, 235, 118.

Draw a histogram of the frequency distribution, taking one of the class intervals as 50–100.

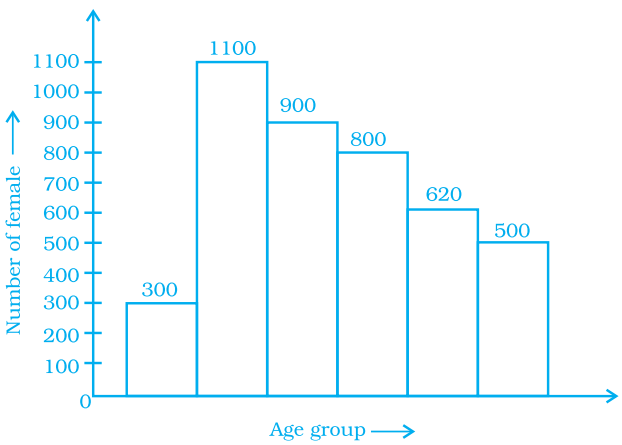
104. The below histogram shows the number of literate females in the age group of 10 to 40 years in a town.

(a) Write the classes assuming all the classes are of equal width.

(b) What is the classes width?

(c) In which age group are literate females the least?

(d) In which age group is the number of literate females the highest?



105. The following histogram shows the frequency distribution of teaching experiences of 30 teachers in various schools:

(a) What is the class width?

(b) How many teachers are having the maximum teaching experience and how many have the least teaching experience?

(c) How many teachers have teaching experience of 10 to 20 years?

106. In a district, the number of branches of different banks is given below:

Bank	State Bank of India	Bank of Baroda	Punjab National Bank	Canara Bank
Number of Branches	30	17	15	10

Draw a pie chart for this data.

107. For the development of basic infrastructure in a district, a project of Rs 108 crore approved by Development Bank is as follows:

Item Head	Road	Electricity	Drinking water	Sewerage
Amount in crore (Rs.)	43.2	16.2	27.00	21.6

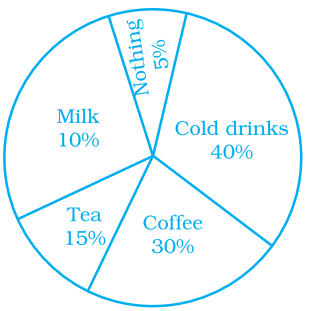
Draw a pie chart for this data.

108. In the time table of a school, periods allotted per week to different teaching subjects are given below:

Subject	Hindi	English	Maths	Science	Social Science	Computer	Sanskrit
Periods Allotted	7	8	8	8	7	4	3

Draw a pie chart for this data.

109. A survey was carried out to find the favourite beverage preferred by a certain group of young people. The following pie chart shows the findings of this survey.



From this pie chart answer the following:

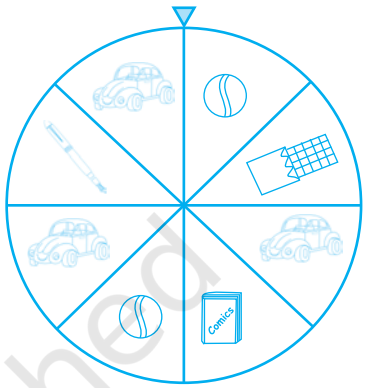
(i) Which type of beverage is liked by the maximum number of people.

(ii) If 45 people like tea, how many people were surveyed?

110. The following data represents the approximate percentage of water in various oceans. Prepare a pie chart for the given data.

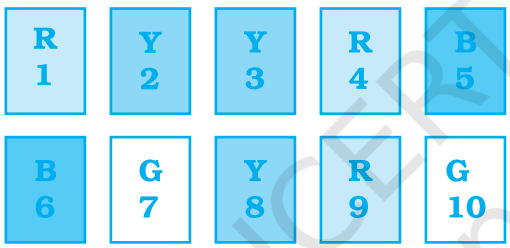
Pacific	40%
Atlantic	30%
Indian	20%
Others	10%

111. At a Birthday Party, the children spin a wheel to get a gift. Find the probability of



(a) getting a ball
(b) getting a toy car
(c) any toy except a chocolate

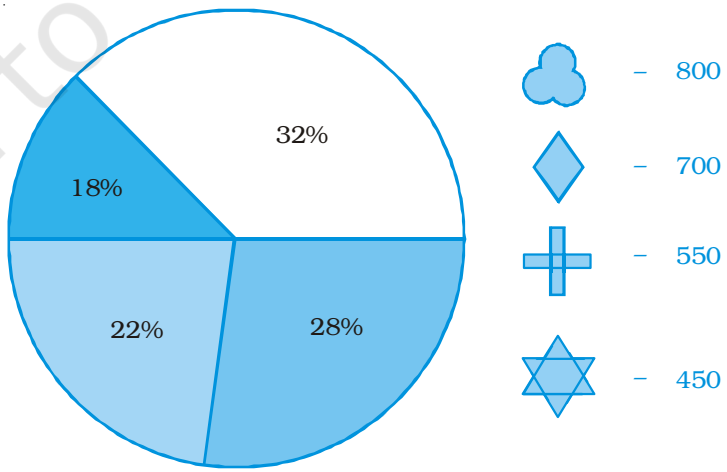
112. Sonia picks up a card from the given cards.



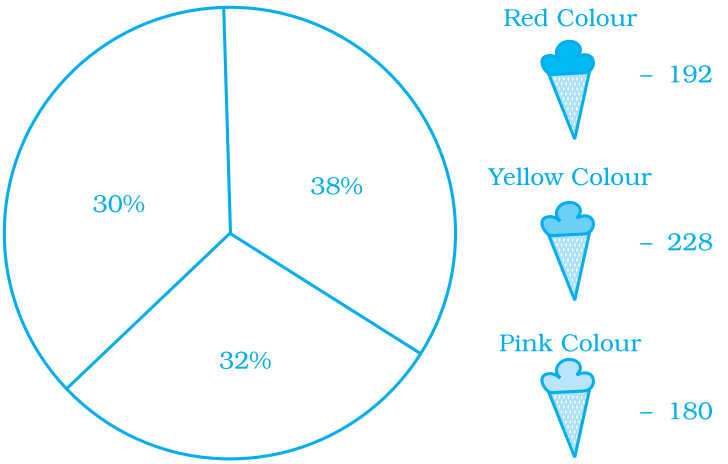
Calculate the probability of getting

(a) an odd number
(b) a Y card
(c) a G card
(d) B card bearing number > 7

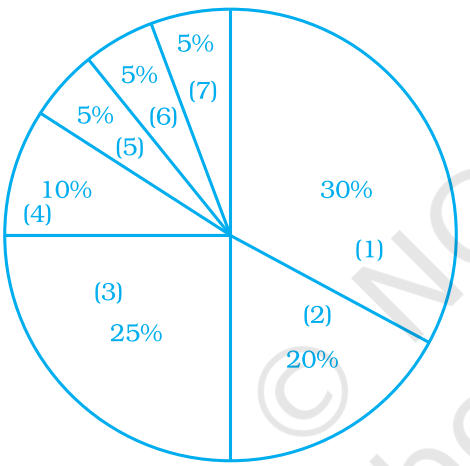
113. Identify which symbol should appear in each sector in 113, 114.



114.



115. A financial counselor gave a client this pie chart describing how to budget his income. If the client brings home Rs. 50,000 each month, how much should he spend in each category?

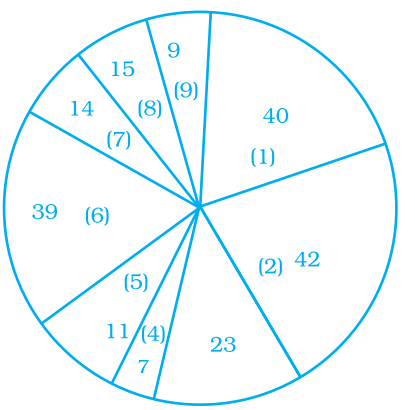


1. Housing
2. Food (including eating out)
3. Car Loan & Maintenance
4. Utilities
5. Phone
6. Clothing
7. Entertainment

116. Following is a pie chart showing the amount spent in rupees (in thousands) by a company on various modes of advertising for a product.

Now answer the following questions.

1. Which type of media advertising is the greatest amount of the total?
2. Which type of media advertising is the least amount of the total?



1. Television
2. Newspapers
3. Magazines
4. Radio
5. Business papers
6. Direct mail
7. Yellow pages
8. Outdoor
9. Miscellaneous

3. What per cent of the total advertising amount is spent on direct mail campaigns?
4. What per cent of the advertising amount is spent on newspaper and magazine advertisements?
5. What media types do you think are included in miscellaneous? Why aren't those media types given their own category?

(D) Application, Games and Puzzles

1 Card Activity

	Face Cards			Number Cards									
	K	Q	J	10	9	8	7	6	5	4	3	2	A	Total
Spade														
Heart														
Diamond														
Club														
Total														

1. How many colours can you observe?
2. How many cards are there in all?
3. How many cards of one type are there?
4. How many types of cards can you observe? Name them.
5. How many black cards are there in all?
6. How many red cards are there in all?
7. How many face cards of each type are there?
8. How many picture cards are there in all?

9. From a pack of well-shuffled cards, what is the probability of getting

(i) a black face card (ii) a red jack iii) a 4 of spade

iv) a picture card (v) a red card of ace (vi) a black king

(vii) an ordinary card (viii) a picture card of heart

(ix) an ace of club (x) a king

(xi) a card of diamond (xii) a black ordinary card

2 Playing with dice

(a) Complete the table given below and answer the questions that follow:

A				B			
Dice 1	**Dice 2**	**Out-comes**	**Sum**	**Dice 1**	**Dice 2**	**Out-comes**	**Sum**
		(1,1)	2				
		(1,2)	3				
		(1,3)	4				
		(1,4)	5				

The Paper Chase

Pratibha's desk has 8 drawers. When she receives a paper, she usually chooses a drawer at random to put it in. However, 2 out of 10 times she forgets to put the paper away, and it gets lost.

The probability that a paper will get lost is $\frac{2}{10}$, or $\frac{1}{5}$.

- What is the probability that a paper will be put into a drawer?
- If all drawers are equally likely to be chosen, what is the probability that a paper will be put in drawer 3?

When Pratibha needs a document, she looks first in drawer 1 and then checks each drawer in order until the paper is found or until she has looked in all the drawers.

1. If Pratibha checked drawer 1 and didn't find the paper she was looking for, what is the probability that the paper will be found in one of the remaining 7 drawers?
2. If Pratibha checked drawers 1, 2 and 3, and didn't find the paper she was looking for, what is the probability that the paper will be found in one of the remaining 5 drawers?
3. If Pratibha checked drawers 1–7 and didn't find the paper she was looking for, what is the probability that the paper will be found in the last drawer?

(b) Complete the table given below.

Sum of dots on both the dice	Tally marks	Number of outcomes	Probability
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			

Two dice are rolled together, using the above table find the probability of—

(i) sum of digits to be more than 6.

(ii) sum of digits to be less than 3.

(iii) sum of digits to be either 5 or 6.

(iv) sum of digits to be 12.

(v) sum of digits to be less than 9 but more than 5.

3 DATA COLLECTION

Read the paragraph given below and complete the tables given.

All of us have some concept of statistics because magazines, newspapers, radio and TV advertisements are full of statistics or numerical data. Existence of the practice of collecting numerical data in ancient India is evident from the fact that during the reign of Chandragupta Maurya, there was a good system of collecting such data especially with regard to births and deaths. During Akbar's reign, Raja Todarmal, the Land and Revenue Minister, maintained good records of land and agricultural statistics. In Ain-i-Akbari written by Abul Fazal, a detailed account of the administrative and statistical surveys conducted during that period can be found.

From the paragraph given on the previous page prepare the frequency table of all the letters of the English alphabet and answer the questions that follow.

1. Frequency table for each letter of the alphabet.

Letter	Tally marks	Frequency
A		
B		
C		
-		
-		
-		
Z		

(a) Which is the least frequently occuring letter?

(b) Which vowel is most commonly used?

(c) Which consonant is most commonly used?

(d) Find the ratio of vowels to that of consonants.

2. Frequecy table for words with two or more letters.

Number of words with	Tally marks	Frequency
2 letters		
3 letters		
4 letters		
5 letters		
6 letters		
more than 6 letters		

(a) How many two letter words are used in the paragraph?

(b) How many words are used in all?

(c) How many words have five letters or more?

(d) What is the ratio of three letter words and five letter words?

4 Fun Activity

Take a packet which has different colours of toffees/candies in it. Count the number of toffees of each colour and fill the data in the table given below. Also draw a pie chart to depict the data.

12/04/18

Colour of candies	Number	Fraction	Fraction of 360°
Red			
Green			

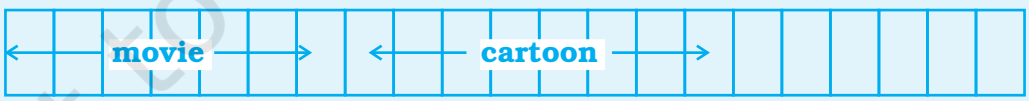
5 Conducting Survey

Conduct a class survey to know the favourite T.V. channels and note the responses in the following table.

Channels	Number of Votes	Fraction of Total Votes	Estimated per cent of Total Votes	Caculated per cent of Total Votes
News				
Movies				
History and Nature				
Cartoon				
Sports				

How accurate is your estimation?

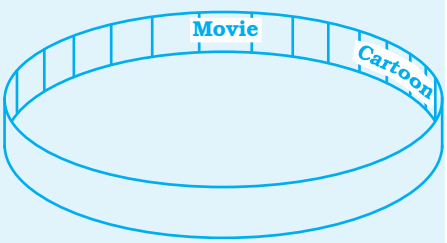
Now, take a strip of thick chart paper, 1 cm wide and divide it into equal-sized rectangles – one for each student of your class. The entire strip represents your whole class, or 100% of the votes. On your strip, colour groups of rectangles according to the number of votes each choice received. Use a different colour for each choice. For example, if 5 students voted for movie, colour the first 5 rectangles blue. If 7 choose cartoon, colour the next 7 rectangle green. When you are finished, all the rectangles should be coloured.



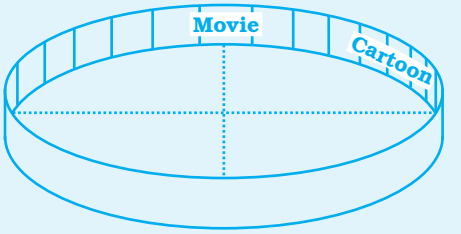
Now create a circle graph as shown below.

– Tape the ends of your strip together, with no overlap, to form a loop with the coloured rectangles inside.

– Tape four copies of the quarter-circle template together to form a circle.

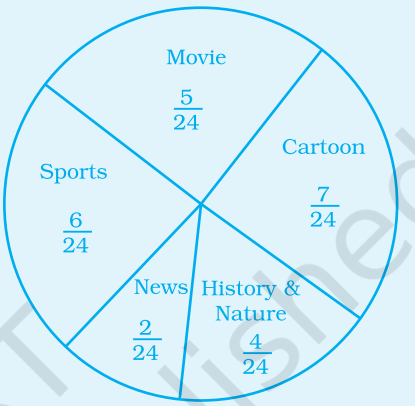


– Place your above loop around the circle. On the edge of the circle, mark where each colour begins and ends.



– Remove the loop, and use a ruler to connect each mark you made to the centre of the circle.

– Colour the sections of your graph. Label each section with the channels name and the fraction of votes that channel received. For example, your circle graph known as pie chart might look like this.

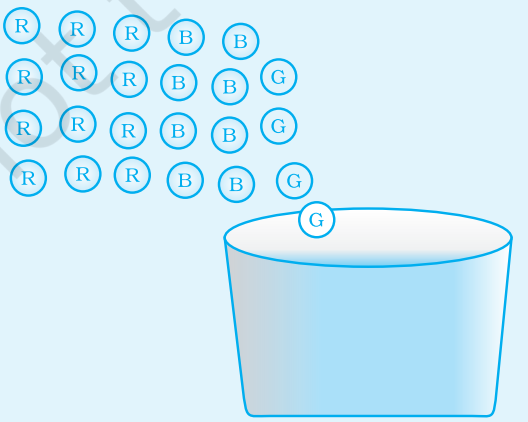


Circle graphs in books, magazines, and newspapers are often labeled with per cents. Add per cent labels to your pie chart.

6 Marble Game

Pramod is babysitting his little sister Monika and her two friends, Puja and Jyoti. Monika is wearing red, Puja is wearing blue and Jyoti is wearing green coloured clothes.

Pramod fills a bucket with 12 red (R) marbles, 8 blue (B) marbles and 4 green (G) marbles. He tells the girls that they will play a game. He will reach into the bucket and pull out a marble at random. The girl whose clothes match the colour of the marble scores 1 point.



a. What is the probability of each girl scoring 1 point on the first draw?

Monika :

Puja :

Jyoti :

b. What is the probability of not drawing a green marble on the first draw?

c. If two marbles of each colour are added to the bucket, do the probabilities in part (a) change? Explain your answer.

d. If the number of each colour is doubled, do the probabilities in part (a) change? Explain why or why not.

7 Crossword Puzzle

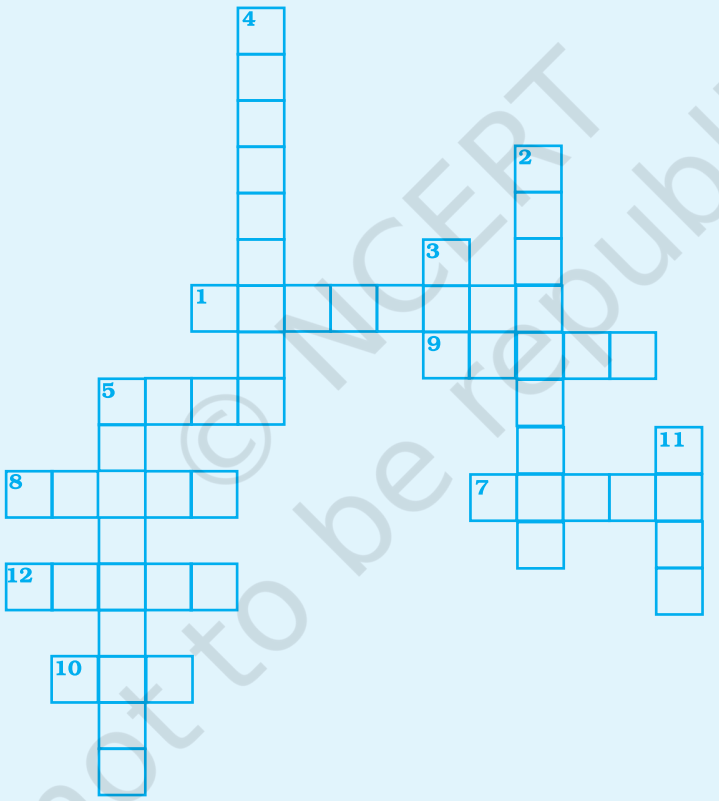
Solve the crossword (given on the next page) and then fill up the given boxes. Clues are given below for across as well as downward filling. Also, for across and down clues, due number is written at the corner of the boxes. Answer of clues have to be filled in their respective boxes.

Across

1. Another name for a circle graph is _____.
5. Class width of the interval 10-15 is _____.
7. Difference of highest and lowest observations in a given data is called _____.
8. Each outcome or a collection of outcomes in an experiment is known as _____.
9. Pie chart represents the comparison of parts to a _____.
10. Probability of sun rising in the east is _____.
12. Probability of getting a head or a tail on tossing a coin once is _____.

Down

2. Representation of grouped data graphically is called _____.
3. Unorganised and ungrouped data are called _____.
4. Difference between upper and lower class limit is known as _____.
6. The number of times a particular observation occurs in the given data is called _____.
11. If today is Saturday, then the probability of two days after tomorrow being a Monday is _____.



Rough Work

Rough Work

Rough Work

UNIT 3

SQUARE-SQUARE ROOT AND CUBE-CUBE ROOT

(A) Main Concepts and Results

- A natural number is called a ***perfect square*** if it is the square of some natural number.

  i.e., if $m = n^2$, then m is a perfect square where m and n are natural numbers.

- A natural number is called a ***perfect cube*** if it is the cube of some natural number.

  i.e., if $m = n^3$, then m is a perfect cube where m and n are natural numbers.

- Number obtained when a number is multiplied by itself is called the square of the number.
- Number obtained when a number is multiplied by itself three times are called ***cube number***.
- Squares and cubes of even numbers are even.
- Squares and cubes of odd numbers are odd.
- A perfect square can always be expressed as the product of pairs of prime factors.
- A perfect cube can always be expressed as the product of triplets of prime factors.

- The unit digit of a perfect square can be only 0, 1, 4, 5, 6 or 9.
- The square of a number having:

  1 or 9 at the units place ends in1.

  2 or 8 at the units place ends in 4.

  3 or 7 at the units place ends in 9.

  4 or 6 at the units place ends in 6.

  5 at the units place ends in 5.
- There are $2n$ natural numbers between the squares of numbers n and $n+1$.
- A number ending in odd numbers of zeroes is not a perfect square.
- The sum of first n odd natural numbers is given by n^2.
- Three natural numbers a, b, c are said to form a pythagorean triplet if $a^2 + b^2 = c^2$.
- For every natural number $m > 1$, $2m$, m^2-1 and $m^2 + 1$ form a pythagorean triplet.
- The square root of a number x is the number whose square is x. Positive square root of a number x is denoted by $\sqrt{x}$.
- The cube root of a number x is the number whose cube is x. It is denoted by $\sqrt[3]{x}$.
- Square root and cube root are the inverse operations of squares and cubes respectively.
- If a perfect square is of n digits, then its square root will have $\frac{n}{2}$ digit if n is even or $\left(\frac{n+1}{2}\right)$ digit if n is odd.
- Cubes of the numbers ending with the digits 0, 1, 4, 5, 6 and 9 end with digits 0, 1, 4, 5, 6 and 9 respectively.

Think and Discuss

1. **Describe** what is meant by a perfect square. Give an example.
2. **Explain** how many square roots a positive number can have. How are these square roots different?

Key Concept — To be Noted

SQUARE ROOTS

Words	A square root of a number n is a number m which, when multiplied by itself, equals n.
Numbers	The square roots of 16 are 4 and -4 because $4^2 = 16$ and $(-4)^2 = 16$.
Algebra	If $m^2 = n$, then m is a square root of n.

Think and Discuss

1. Which type of number has an exact square root?
2. Which type of number has an approximate square root?
3. How can we use perfect squares to estimate a square root, such as $\sqrt{8}$?

- Cube of the number ending in 2 ends in 8 and cube root of the number ending in 8 ends in 2.
- Cube of the number ending in 3 ends in 7 and cube root of the number ending in 7 ends in 3.

(B) Solved Examples

In examples 1 to 7, out of given four choices only one is correct. Write the correct answer.

Example 1 : Which of the following is the square of an odd number?

(a) 256 (b) 361 (c) 144 (d) 400

Solution : Correct answer is (b).

Example 2 : Which of the following will have 1 at its units place?

(a) 19^2 (b) 17^2 (c) 18^2 (d) 16^2

Solution : Correct answer is (a).

Example 3 : How many natural numbers lie between 18^2 and 19^2?

(a) 30 (b) 37 (c) 35 (d) 36

Solution : Correct answer is (d).

Example 4 : Which of the following is not a perfect square?

(a) 361 (b) 1156 (c) 1128 (d) 1681

Solution : Correct answer is (c).

Example 5 : A perfect square can never have the following digit at ones place.

(a) 1 (b) 6 (c) 5 (d) 3

Solution : Correct answer is (d).

Example 6 : The value of $\sqrt{176+\sqrt{2401}}$ is

(a) 14 (b) 15 (c) 16 (d) 17

Solution : Correct answer is (b).

$\left(\sqrt{176+\sqrt{2401}} = \sqrt{176+49} = \sqrt{225} = 15\right)$

Example 7 : Given that $\sqrt{5625}$ =75, the value of $\sqrt{0.5625}+\sqrt{56.25}$ is:

(a) 82.5 (b) 0.75 (c) 8.25 (d) 75.05

Solution : Correct answer is (c).

If ($\sqrt{5625}$ = 75, then $\sqrt{0.5625}$ = 0.75 and $\sqrt{56.25}$ = 7.5)

In examples 8 to 14, fill in the blanks to make the statements true.

Example 8 : There are _____ perfect squares between 1 and 50.

Solution : 6

Example 9 : The cube of 100 will have _____ zeroes.

Solution : 6

Example 10 : The square of 6.1 is _____.

Solution : 37.21

1. Squaring a number and taking a square root are inverse operations. What other inverse operations do you know?
2. When the factors of a perfect square are written in order from the least to greatest, what do you notice?
3. Why do you think numbers such as 4, 9, 16, ... are called perfect squares?
4. Suppose you list the factors of a perfect square. Why is one factor square root and not the other factors?

Example 11 : The cube of 0.3 is _____.

Solution : 0.027

Connect

here are some ways to tell whether a number is a square number.

- If we can find a division sentence for a number so that the quotient is equal to the divisor, the number is a square number.

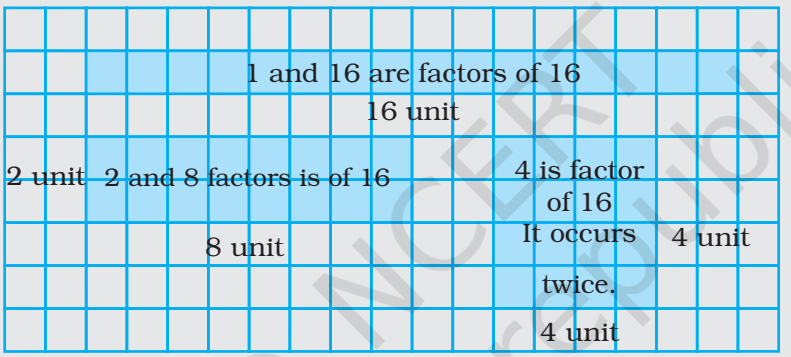
  For example, 16 ÷ 4 = 4, so 16 is a square number.

  dividend ↑ divisor ↑ quotient ↖

- We can also use factoring.

  Factors of a number occur in pairs.

  These are the dimensions of a rectangle.



Sixteen has 5 factors: 1, 2, 4, 8, 16

Since there is an odd number of factors, one rectangle is a square.

The square has side length of 4 units.

We say that 4 is a square root of 16.

We write $4 = \sqrt{16}$

When a number has an odd number of factors, it is a square number.

A factor that occurs twice is only written once in the list of factors.

Think and Discuss

1. **Discuss** whether 9.5 is a good first guess for $\sqrt{75}$.
2. **Determine** which square root or roots would have 7.5 as a good first guess.

Example 12 : 68^2 will have _____ at the units place.

Solution : 4

Example 13 : The positive square root of a number x is denoted by _____.

Solution : $\sqrt{x}$

Example 14 : The least number to be multiplied with 9 to make it a perfect cube is _____.

Solution : 3

In examples 15 to 19, state whether the statements are true (T) or false (F)

Example 15 : The square of 0.4 is 0.16.

Solution : True

Example 16 : The cube root of 729 is 8.

Solution : False

Example 17 : There are 21 natural numbers between 10^2 and 11^2.

Solution: False

Example 18 : The sum of first 7 odd natural numbers is 49.

Solution : True

Example 19 : The square root of a perfect square of n digits will have $\frac{n}{2}$ digits if n is even.

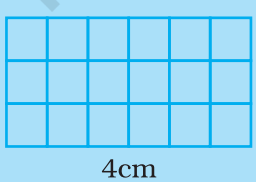
Solution : True

Example 20 : Express 36 as a sum of successive odd natural numbers.

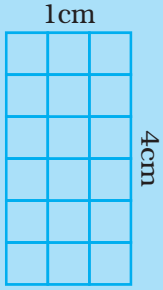
Solution : 1+3+5+7+9+11 = 36

A rectangle is a quadrilateral with 4 right angles.
A square also has 4 right angles.

A rectangle with base 4 cm and height 1cm is the same as a rectangle with base 1cm and height 4 cm.

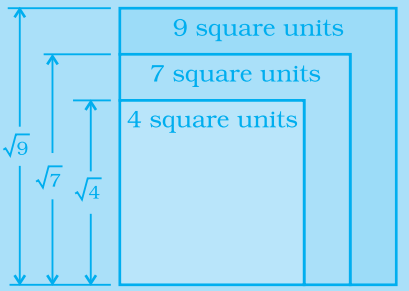


These two rectangles are congruent.
Is every square a rectangle?
Is every rectangle a square?



Copy this diagram on grid paper.

Then estimate the value of $\sqrt{7}$ to one decimal place.



Example 21 : Check whether 90 is a perfect square or not by using prime factorisation.

Solution : Prime factorisation of 90 is

2	90
3	45
3	15
5	5
	1

$90 = 2 \times 3 \times 3 \times 5$

The prime factors 2 and 5 do not occur in pairs. Therefore, 90 is not a perfect square.

Example 22 : Check whether 1728 is a perfect cube by using prime factorisation.

Solution : Prime factorisation of 1728 is

$1728 = \underline{2 \times 2 \times 2} \times \underline{2 \times 2 \times 2} \times \underline{3 \times 3 \times 3}$

Since all prime factors can be grouped in triplets. Therefore, 1728 is a perfect cube.

Apply

Use square tiles. Make as many different rectangles as you can with area 28 square units.
Draw your rectangles on grid paper.
Is 28 a perfect square? Justify your answer.

Example 23 : Using distributive law, find the square of 43.

Solution : $43 = 40 + 3$

So $43^2 = (40 + 3)^2 = (40 + 3)\,(40 + 3) = 40\,(40 + 3) + 3(40 + 3)$

$= 40 \times 40 + 40 \times 3 + 3 \times 40 + 3 \times 3$

$= 1600 + 240 + 9$

$= 1849$

So, $43^2 = 1849$

Example 24 : Write a pythagorean triplet whose smallest number is 6.

Solution : Smallest number is 6

$2m = 6$ or $m = 3$

$m^2 + 1 = 3^2 + 1 = 9 + 1 = 10$

$m^2 - 1 = 3^2 - 1 = 9 - 1 = 8$

So, the pythagorean triplet is 6, 8, 10.

Connect

Here is one way to estimate the value of $\sqrt{20}$:

- 25 is the square number closest to 20, but greater than 20.

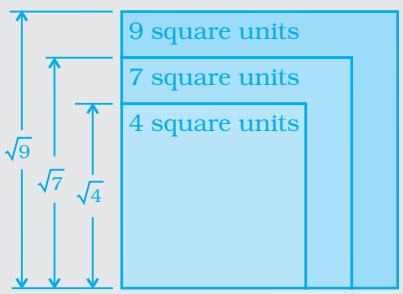
  On grid paper, draw a square with area 25.

  Its side length: $\sqrt{25} = 5$

- 16 is the square number closest to 20, but less than 20.

  Draw a square with area 16

  Its side length: $\sqrt{16} = 4$



Draw the squares so that they overlap.

A square with area 20 lies between these two squares.

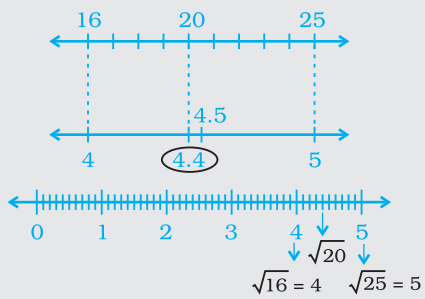
Its side length $\sqrt{20}$.

20 is between 16 and 25, but closer to 16.

So, $\sqrt{20}$ is between $\sqrt{16}$ and $\sqrt{25}$, but closer to $\sqrt{16}$.

So, $\sqrt{20}$ is between 4 and 5, but closer to 4.

An estimate of $\sqrt{20}$ is 4.4 to one decimal place.



Application on Problem Solving Strategy

A couple wants to install a square glass window that has an area of 500 square cm. Calculate the length of each side and the length of trim needed to the nearest tenth of cm.

Understand the problem

First find the length of a side. Then you can use the length of the side to find the perimeter – the length of the trim around the window.

Make a Plan

The length of a side, in cm, is the number that you multiply by itself to get 500. Find this number to the nearest tenth.

Use guess and check to find $\sqrt{500}$.

Solve

Because 5000 is between 22^2 (484) and 23^2 (529), the square root of 500 is between 22 and 23.

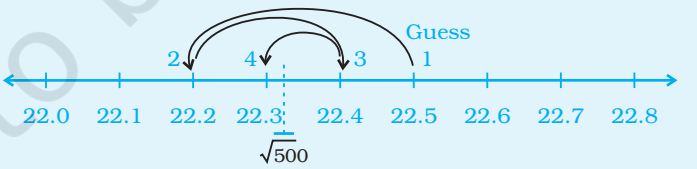
The square root is between 22.3 and 22.4. To round to the nearest tenth, consider 22.35.

$22.35^2 = 499.5225$ *low*

Guess 22.5	Guess 22.2	Guess 22.4	Guess 22.3
22.5^2 506.25	22.2^2 492.84	22.4^2 501.76	22.3^2 497.29
high	low	high	low
Square root is between 22 and 22.5	Square root is between 22.2 and 22.5	Square root is between 22.2 and 22.4	Square root is between 22.3 and 22.4

The square root must be greater than 22.35, so you can round up.

To the nearest tenth, $\sqrt{500}$ is about 22.4.



Now estimate the length around the window. The length of a side of the window to the nearest tenth of an inch is 22.4 inches.

$4 \times 22.4 = 89.6$ *(Perimeter = 4 × side)*

The trim is about 89.6 cm long.

Look Back

The length 90 cm divided by 4 is 22.5 cm. A 22.5 cm square has an area of 506 square cm, which is close to 500, so the answers are reasonable.

Example 25 : Using prime factorisation, find the cube root of 5832.

Solution : The prime factorisation of 5832 is

2	5832
2	2916
2	1458
3	729
3	243
3	81
3	27
3	9
3	3
	1

$5832 = 2 \times 2 \times 2 \times 3 \times 3 \times 3 \times 3 \times 3 \times 3$

Therefore, $\sqrt[3]{5832} = \sqrt[3]{2\times2\times2\times3\times3\times3\times3\times3\times3}$

$= 2 \times 3 \times 3$

$= 18$

Take It Further

a) Find the square root of each palindromic number.
A palindromic number is a number that reads the same – forward and backward.

(i) $\sqrt{121}$

(ii) $\sqrt{12321}$

(iii) $\sqrt{1234321}$

(iv) $\sqrt{123454321}$

b) Continue the pattern.
Write the next 4 palindromic numbers in the pattern and their square roots.

Think and Discuss

1. Is 1 a square number? How can you tell?
2. Suppose you know the area of a square. How can you find its perimeter?
3. Suppose you know the perimeter of a square. How can you find its area?

Example 26 : Evaluate the square root of 22.09 by long division method.

Solution : 4.7

4	22.09
	16
87	609
	609
	0

Therefore, $\sqrt{22.09} = 4.7$

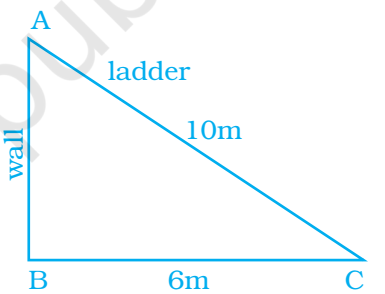
Example 27 : Find the smallest perfect square divisible by 3, 4, 5 and 6.

Solution : The least number divisible by 3, 4, 5 and 6 is their LCM. The LCM of 3, 4, 5 and 6 is 60. Now, $60 = 2 \times 2 \times 5 \times 3$.

We see that prime factors 5 and 3 are not in pairs. Therefore 60 is not a perfect square. So, 60 should be multiplied by $5 \times 3 = 15$ to get a perfect square.

Thus, the required least square number = $60 \times 15 = 900$.

Example 28 : A ladder 10m long rests against a vertical wall. If the foot of the ladder is 6m away from the wall and the ladder just reaches the top of the wall, how high is the wall?



Solution : Let AC be the ladder.

Therefore, AC = 10m

Let BC be the distance between the foot of the ladder and the wall.

Therefore,BC = 6m

ΔABC forms a right angled triangle, right angled at B.

By Pythagoras theorem,

$$AC^2 = AB^2 + BC^2$$

$$10^2 = AB^2 + 6^2$$

or $$AB^2 = 10^2 - 6^2 = 100 - 36 = 64$$

or $$AB = \sqrt{64} = 8m$$

Hence, the wall is 8m high.

Example 29 : Find the length of a diagonal of a rectangle with dimensions 20m by 15m.

Solution : Using Pythagoras theorem, we have

Length of diagonal of the rectangle

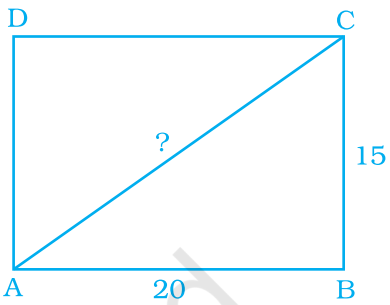
$= \sqrt{(l^2 + b^2)}$ units

$= \sqrt{(20^2 + 15^2)}$ m

$= \sqrt{400 + 225}$ m

$= \sqrt{625}$ m

$= 25$ m



Hence, the length of diagonal is 25m.

Investigate

Work with a partner.
You will need grid paper and 20 square tiles.
Use the tiles to make as many different rectangles as you can with each area.

4 square units	12 square units
6 square units	16 square units
8 square units	20 square units
9 square units	

Draw the rectangles on grid paper.

- For how many areas given above were you able to make a square?
- What is the side length of each square you made?
- How is the side length of a square related to its area?

Think and Discuss

Compare your strategies and results with those of another pair of classmates.

Find two areas greater than 20 square units for which you could use tiles to make a square.

How do you know you could make a square for each of these areas?

Example 30 : The area of a rectangular field whose length is twice its breadth is 2450 m^2. Find the perimeter of the field.

Solution : Let the breadth of the field be x metres. Then length of the field is $2x$ metres.

Therefore, area of the rectangular field = length × breadth

$$= (2x)(x) = (2x^2)\ m^2$$

Given that area is 2450 m^2.

Therefore, $2x^2 = 2450$

$$x^2 = \frac{2450}{2}$$

$$x = \sqrt{1225} \text{ or } x = 35m$$

Hence, breadth = $35m$ and length $35 \times 2 = 70m$

Perimeter of the field = $2\ (l + b)$

$$= 2(70+35)m = 2\times105m = 210m$$

Example 31 : During a mass drill exercise, 6250 students of different schools are arranged in rows such that the number of students in each row is equal to the number of rows. In doing so, the instructor finds out that 9 children are left out. Find the number of children in each row of the square.

Solution : Total number of students = 6250

Number of students forming a square = 6250 – 9

$$= 6241$$

Thus, 6241 students form a big square which has number of rows equal to the number of students in each row.

Let the number of students in each row be x, then the number of rows = x

Therefore, $x \times x = 6241$

or $x = \sqrt{6241} = 79$

Hence, there are 79 students in each row of the square formed.

Example 32 : Find the least number that must be added to 1500 so as to get a perfect square. Also find the square root of the perfect square.

Solution :

		38
3		1500
		9
68		600
		544
		56

We observe that $38^2 < 1500 < 39^2$

Hence the number to be added $= 39^2 - 1500$

$= 1521 - 1500$

$= 21$

Therefore, the perfect square is $1500 + 21 = 1521$

$\sqrt{1521} = 39$

Hence the required number is 21 and the square root is 39.

Tsunamis, sometimes called tidal waves, move across deep oceans at high speeds with barely a ripple on the water surface. It is only when tsunamis hit shallow water that their energy moves them upward into a huge destructive force.

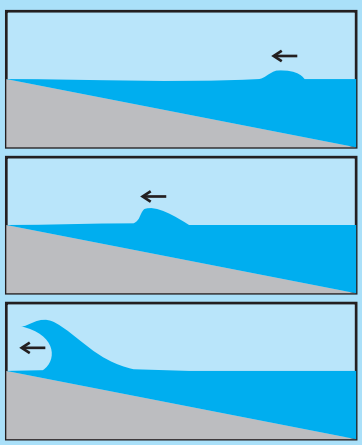
Tsunamis can be caused by earthquakes, volcanoes, landslides, or meteorites.

1. The speed of a tsunami, in metre per second, can be found by the formula $r = \sqrt{9.7344d}$, where d is the water depth in metre. Suppose the water depth is $6400m$. How fast is the tsunami moving?

2. The speed of a tsunami in km per hour can be found using $r = \sqrt{4.4944d}$ where d is the water depth in metre. Suppose the water depth is 8100 metre

   a) How fast is the tsunami moving in km per hour?

   b) How long would it take a tsunami to travel 3000 km if the water depth was a consistent 3000 m?



As the wave approaches the beach, it slows, builds in height and crashes on shore

Example 33 : Application of problem solving strategies

- Find the smallest number by which 1620 must be divided to get a perfect square.

Solution : Understand and Explore

- What information is given in the question? – A number which is not a perfect square.
- What are you trying to find? – The smallest number by which 1620 must be divided to get a perfect square.

Plan a strategy

- You have already learnt prime factorisation. Use it to find the product of prime factors of 1620.
- Pair the prime factors to see if any factor is left unpaired.
- This unpaired factor will be the smallest number that must be divided to get a perfect square.

Solve

Prime factorisation of 1620 is

2	1620
2	810
5	405
3	81
3	27
3	9
3	3
	1

The product of prime factors = $2 \times 2 \times 5 \times 3 \times 3 \times 3 \times 3$

Pair these prime factors = $\mathbf{2 \times 2} \times 5 \times \mathbf{3 \times 3} \times \mathbf{3 \times 3}$

The factor 5 is left unpaired.

Hence, the required smallest number is 5.

Revise

Divide 1620 by 5 and check if it is a perfect square.

$1620 \div 5 = 324$

We see that 324 is a perfect square, hence our answer is verified.

Think and Discuss

1. Find the square root of the number obtained in step IV.
2. Can you find the smallest number that can be multiplied to 1620 to get a perfect square?
3. Find the square root.

(C) Exercise

In each of the questions, 1 to 24, write the correct answer from the given four options.

1. 196 is the square of

(a) 11 (b) 12 (c) 14 (d) 16

2. Which of the following is a square of an even number?

(a) 144 (b) 169 (c) 441 (d) 625

3. A number ending in 9 will have the units place of its square as

(a) 3 (b) 9 (c) 1 (d) 6

Magic Squares

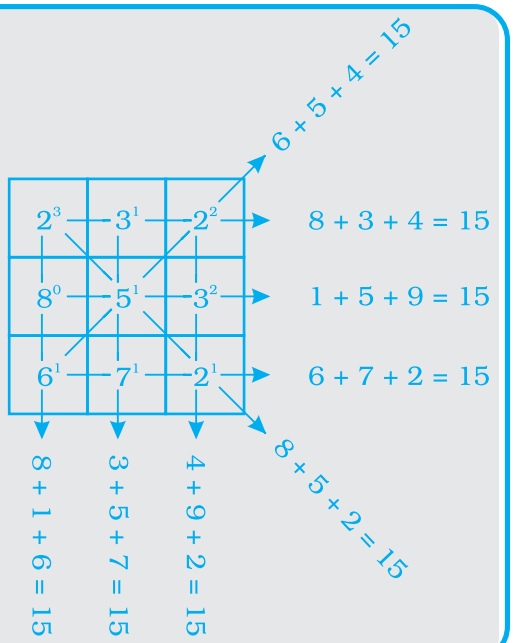
A magic square is a square with numbers arranged so that the sum of the numbers in each row, column and diagonal is the same.

Complete each magic square below.

$\sqrt{36}$		2^2
8^0	$\sqrt{9}$	
	$3^2 - 2$	

	$-(\sqrt{4}+4)$	$-(9^2)$
$-(\sqrt{16})$		0^3
$-(\sqrt{9})$	2^0+1	

Use the numbers –4, –3, –2, –1, 0, 1, 2, 3 and 4 to make a magic square with row, column and diagonal sums of 0.



4. Which of the following will have 4 at the units place?

(a) 14^2 (b) 62^2 (c) 27^2 (d) 35^2

5. How many natural numbers lie between 5^2 and 6^2?

(a) 9 (b) 10 (c) 11 (d) 12

6. Which of the following cannot be a perfect square?

(a) 841 (b) 529 (c) 198

(d) All of the above

7. The one's digit of the cube of 23 is

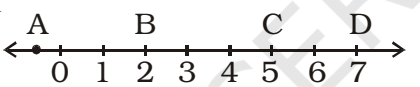
(a) 6 (b) 7 (c) 3 (d) 9

8. A square board has an area of 144 square units. How long is each side of the board?

(a) 11 units (b) 12 units (c) 13 units (d) 14 units

9. Which letter best represents the location of $\sqrt{25}$ on a number line?

(a) A (b) B (c) C (d) D



10. If one member of a pythagorean triplet is 2m, then the other two members are

(a) m, m^2+1

(b) m^2+1, m^2-1

(c) m^2, m^2-1

(d) $m^2, m+1$

11. The sum of successive odd numbers 1, 3, 5, 7, 9, 11, 13 and 15 is

(a) 81 (b) 64 (c) 49 (d) 36

12. The sum of first n odd natural numbers is

(a) $2n+1$ (b) n^2 (c) n^2-1 (d) n^2+1

13. Which of the following numbers is a perfect cube?

(a) 243 (b) 216 (c) 392 (d) 8640

14. The hypotenuse of a right triangle with its legs of lengths $3x \times 4x$ is

(a) $5x$ (b) $7x$ (c) $16x$ (d) $25x$

15. The next two numbers in the number pattern 1, 4, 9, 16, 25 ... are

(a)35, 48 (b) 36, 49 (c) 36, 48 (d) 35,49

16. Which among 43^2, 67^2, 52^2, 59^2 would end with digit 1?

(a) 43^2 (b) 67^2 (c) 52^2 (d) 59^2

17. A perfect square can never have the following digit in its ones place.

(a) 1 (b) 8 (c) 0 (d) 6

18. Which of the following numbers is not a perfect cube?

(a) 216 (b) 567 (c) 125 (d) 343

19. $\sqrt[3]{1000}$ is equal to

(a) 10 (b) 100 (c) 1

(d) None of these

20. If m is the square of a natural number n, then n is

(a) the square of m

(b) greater than m

(c) equal to m

(d) $\sqrt{m}$

21. A perfect square number having n digits where n is even will have square root with

(a) n+1 digit (b) $\frac{n}{2}$ digit (c) $\frac{n}{3}$ digit (d) $\frac{n+1}{2}$ digit

22. If m is the cube root of n, then n is

(a) m^3 (b) $\sqrt{m}$ (c) $\frac{m}{3}$ (d) $\sqrt[3]{m}$

23. The value of $\sqrt{248+\sqrt{52+\sqrt{144}}}$ is

(a) 14 (b) 12 (c) 16 (d) 13

24. Given that $\sqrt{4096}$ = 64, the value of $\sqrt{4096}+\sqrt{40.96}$ is

(a) 74 (b) 60.4 (c) 64.4 (d) 70.4

In questions 25 to 48, fill in the blanks to make the statements true.

25. There are _____ perfect squares between 1 and 100.

26. There are _____ perfect cubes between 1 and 1000.

27. The units digit in the square of 1294 is _____.

28. The square of 500 will have _____ zeroes.

29. There are _____ natural numbers between n^2 and $(n + 1)^2$

30. The square root of 24025 will have _____ digits.

31. The square of 5.5 is _____.

32. The square root of 5.3×5.3 is _____.

33. The cube of 100 will have _____ zeroes.

34. $1m^2$ = _____ cm^2.

35. $1m^3$ = _____ cm^3.

36. Ones digit in the cube of 38 is _____.

37. The square of 0.7 is _____.

38. The sum of first six odd natural numbers is _____.

39. The digit at the ones place of 57^2 is _____.

40. The sides of a right triangle whose hypotenuse is 17cm are _____ and _____.

41. $\sqrt{1.96}$ = _____.

42. $(1.2)^3$ = _____.

43. The cube of an odd number is always an _____ number.

44. The cube root of a number x is denoted by _____.

45. The least number by which 125 be multiplied to make it a perfect square is _____.

46. The least number by which 72 be multiplied to make it a perfect cube is _____.

47. The least number by which 72 be divided to make it a perfect cube is _____.

48. Cube of a number ending in 7 will end in the digit _____.

In questions 49 to 86, state whether the statements are true (T) or false (F).

49. The square of 86 will have 6 at the units place.

50. The sum of two perfect squares is a perfect square.

51. The product of two perfect squares is a perfect square.

52. There is no square number between 50 and 60.

53. The square root of 1521 is 31.

54. Each prime factor appears 3 times in its cube.

55. The square of 2.8 is 78.4.

56. The cube of 0.4 is 0.064.

57. The square root of 0.9 is 0.3.

58. The square of every natural number is always greater than the number itself.

59. The cube root of 8000 is 200.

60. There are five perfect cubes between 1 and 100.

61. There are 200 natural numbers between 100^2 and 101^2.

62. The sum of first n odd natural numbers is n^2.

63. 1000 is a perfect square.

64. A perfect square can have 8 as its units digit.

65. For every natural number m, $(2m-1, 2m^2-2m, 2m^2-2m+1)$ is a pythagorean triplet.

66. All numbers of a pythagorean triplet are odd.

67. For an integer a, a^3 is always greater than a^2.

68. If x and y are integers such that $x^2 > y^2$, then $x^3 > y^3$.

69. Let x and y be natural numbers. If x divides y, then x^3 divides y^3.

70. If a^2 ends in 5, then a^3 ends in 25.

71. If a^2 ends in 9, then a^3 ends in 7.

72. The square root of a perfect square of n digits will have $\left(\frac{n+1}{2}\right)$ digits, if n is odd.

73. Square root of a number x is denoted by $\sqrt{x}$.

74. A number having 7 at its ones place will have 3 at the units place of its square.

What's the Error? A student said that since the square roots of a certain number are 1.5 and –1.5, the number must be their product, –2.25. What error did the student make?

75. A number having 7 at its ones place will have 3 at the ones place of its cube.

76. The cube of a one digit number cannot be a two digit number.

77. Cube of an even number is odd.

78. Cube of an odd number is even.

79. Cube of an even number is even.

80. Cube of an odd number is odd.

81. 999 is a perfect cube.

82. 363 × 81 is a perfect cube.

83. Cube roots of 8 are +2 and –2.

84. $\sqrt[3]{8+27} = \sqrt[3]{8} + \sqrt[3]{27}$.

85. There is no cube root of a negative integer.

86. Square of a number is positive, so the cube of that number will also be positive.

Solve the following questions.

87. Write the first five square numbers.

88. Write cubes of first three multiples of 3.

89. Show that 500 is not a perfect square.

90. Express 81 as the sum of first nine consecutive odd numbers.

91. Using prime factorisation, find which of the following are perfect squares.

(a) 484 (b) 11250 (c) 841 (d) 729

92. Using prime factorisation, find which of the following are perfect cubes.

(a) 128 (b) 343 (c) 729 (d) 1331

93. Using distributive law, find the squares of

(a) 101 (b) 72

94. Can a right triangle with sides 6cm, 10cm and 8cm be formed? Give reason.

95. Write the Pythagorean triplet whose one of the numbers is 4.

96. Using prime factorisation, find the square roots of

(a) 11025 (b) 4761

97. Using prime factorisation, find the cube roots of

(a) 512 (b) 2197

98. Is 176 a perfect square? If not, find the smallest number by which it should be multiplied to get a perfect square.

99. Is 9720 a perfect cube? If not, find the smallest number by which it should be divided to get a perfect cube.

100. Write two Pythagorean triplets each having one of the numbers as 5.

101. By what smallest number should 216 be divided so that the quotient is a perfect square. Also find the square root of the quotient.

102. By what smallest number should 3600 be multiplied so that the quotient is a perfect cube. Also find the cube root of the quotient.

103. Find the square root of the following by long division method.

(a) 1369 (b) 5625

104. Find the square root of the following by long division method.

(a) 27.04 (b) 1.44

105. What is the least number that should be subtracted from 1385 to get a perfect square? Also find the square root of the perfect square.

106. What is the least number that should be added to 6200 to make it a perfect square?

107. Find the least number of four digits that is a perfect square.

108. Find the greatest number of three digits that is a perfect square.

109. Find the least square number which is exactly divisible by 3, 4, 5, 6 and 8.

110. Find the length of the side of a square if the length of its diagonal is 10cm.

111. A decimal number is multiplied by itself. If the product is 51.84, find the number.

112. Find the decimal fraction which when multiplied by itself gives 84.64.

113. A farmer wants to plough his square field of side 150m. How much area will he have to plough?

114. What will be the number of unit squares on each side of a square graph paper if the total number of unit squares is 256?

115. If one side of a cube is 15m in length, find its volume.

116. The dimensions of a rectangular field are 80m and 18m. Find the length of its diagonal.

117. Find the area of a square field if its perimeter is 96m.

118. Find the length of each side of a cube if its volume is 512 cm^3.

119. Three numbers are in the ratio 1:2:3 and the sum of their cubes is 4500. Find the numbers.

120. How many square metres of carpet will be required for a square room of side 6.5m to be carpeted.

121. Find the side of a square whose area is equal to the area of a rectangle with sides 6.4m and 2.5m.

122. Difference of two perfect cubes is 189. If the cube root of the smaller of the two numbers is 3, find the cube root of the larger number.

123. Find the number of plants in each row if 1024 plants are arranged so that number of plants in a row is the same as the number of rows.

124. A hall has a capacity of 2704 seats. If the number of rows is equal to the number of seats in each row, then find the number of seats in each row.

125. A General wishes to draw up his 7500 soldiers in the form of a square. After arranging, he found out that some of them are left out. How many soldiers were left out?

126. 8649 students were sitting in a lecture room in such a manner that there were as many students in the row as there were rows in the lecture room. How many students were there in each row of the lecture room?

127. Rahul walks 12m north from his house and turns west to walk 35m to reach his friend's house. While returning, he walks diagonally from his friend's house to reach back to his house. What distance did he walk while returning?

128. A 5.5m long ladder is leaned against a wall. The ladder reaches the wall to a height of 4.4m. Find the distance between the wall and the foot of the ladder.

129. A king wanted to reward his advisor, a wise man of the kingdom. So he asked the wiseman to name his own reward. The wiseman thanked the king but said that he would ask only for some gold coins each day for a month. The coins were to be counted out in a pattern of one coin for the first day, 3 coins for the second day, 5 coins for the third day and so on for 30 days. Without making calculations, find how many coins will the advisor get in that month?

130. Find three numbers in the ratio 2:3:5, the sum of whose squares is 608.

131. Find the smallest square number divisible by each one of the numbers 8, 9 and 10.

132. The area of a square plot is $101\frac{1}{400}$ m^2. Find the length of one side of the plot.

133. Find the square root of 324 by the method of repeated subtraction.

134. Three numbers are in the ratio 2:3:4. The sum of their cubes is 0.334125. Find the numbers.

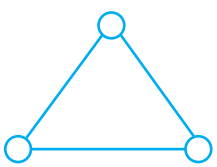
135. Evaluate : $\sqrt[3]{27} + \sqrt[3]{0.008} + \sqrt[3]{0.064}$

136. $\left\{\left(5^2 + (12^2)^{\frac{1}{2}}\right)\right\}^3$

137. $\left\{\left(6^2 + (8^2)^{\frac{1}{2}}\right)\right\}^3$

138. A perfect square number has four digits, none of which is zero. The digits from left to right have values that are: even, even, odd, even. Find the number.

139. Put three different numbers in the circles so that when you add the numbers at the end of each line you always get a perfect square.



140. The perimeters of two squares are 40 and 96 metres respectively. Find the perimeter of another square equal in area to the sum of the first two squares.

141. A three digit perfect square is such that if it is viewed upside down, the number seen is also a perfect square. What is the number?

(Hint: The digits 1, 0 and 8 stay the same when viewed upside down, whereas 9 becomes 6 and 6 becomes 9.)

142. 13 and 31 is a strange pair of numbers such that their squares 169 and 961 are also mirror images of each other. Can you find two other such pairs?

(D) Applications, Games and Puzzles

1. Quick Tricks.

Let me teach you a trick, Karan.

Alright Geeta.

Pick any 2-digit number ending in 5.

45

Take the tens part of the number and multiply it with its successor.

Tens part of 45 is 4. Its successor is 5, so 4 × 5 = 20.

Now prefix this number to the square of 5.

Square of 5 is 25, so number obtained is 2025.

By actual multiplication check if the square of 45 is 2025.

Yes, it is! You are a genius Geeta.

Friends, you can also use the same trick to find the square of any 2-digit number ending in 5.

You all will definitely enjoy it. Now can you find the squares of 25, 75 or 95?

Geeta, can we also try it for any 3-digit number ending in 5?

I think we can if we consider the number at tens and hundreds place together.

Let us try it for 225.

Take the tens part of the number 225 and multiple by it with its successor.

The successor or of 22 is 23 so 22 × 23 = 506

Now prefix this number to the square of 5.

So, the number now becomes 50625.

Good. Check it by actual multiplication.

The square is correct.

Friends, you can also try this trick for 425 or 705 or any other 3-digit number ending in 5. You will definitely enjoy it.

Geeta, now let me teach you one trick.

Sure

This trick can help you to find the cube root of any 4, 5 or 6-digit perfect cube orally.

Alright. But what do we have to do for it?

Pick any 4, 5 or 6 digit perfect cube.

91125

From the right put a comma after 3 digits.

91, 125

See the digit at the units place and find the units place of its cube.

Digit at units place is 5 and digit at ones place of its cube is also 5.

Good! This number is the digit at units place of the cube root. Now see the digits before the comma.

91

Ascertain which number's cube is less than this number.

The cube of 4 is 64 which is less than 91.

Absolutely. This is the digit at the tens place of the cube root.

So it means that the cube root is 45.

You are right.

Fascinating!

Friends, you can also try the same for 13824, 2197, 50653 or any other perfect cube of 4, 5 or 6 digit.

Bye for now!

2. Cross Number Puzzle

Down

1. Cube of 9.
2. Missing number to make 12, ____, 37, a pythagorean triplet.
4. Smallest number by which 248 be multiplied to make the resultant a perfect cube number.
5. Square of 75.
6. Smallest square number that is divisible by each of 5 and 11
9. Without adding, find the sum of 1 + 3 + 5 + 7 + 9 + 11.
10. Smallest number which when added to 7669 makes the resultant a perfect square.

Across

2. Square of 19.
3. Look at the numbers given below and find the number which cannot be a perfect square.

   81, 100, 144, 25000
7. Square root of 4489
8. Smallest natural number other than 1 which is a perfect square as well as a perfect cube number.
10. Cube root of 357911.
11. Smallest number which when subtracted from 374695 makes the resultant a perfect square number.

1	2			6
3	5			
4	7	10		
			9	
11			8	

Rough Work

Rough Work

Rough Work