NEW-ERA PUBLIC SCHOOL

CLASS:⇒ 7th

SUBJECT:⇒ MATHEMATICS

SESSION:⇒ 2022

SOLVED ASSIGNMENT OF UNIT-II (2)

CONTENTS:

1: Rational Numbers.

2: Properties of Triangles.

Rational Numbers

Chapter : 03

Rational Numbers:⇒ Any number in the form of p/q where p and q are integers and q is not equal to zero (0). is a rational number. eg $1/2$, $-3/4$ etc

Exercise No: 3.1

Q1: write the following as rational numbers.

a). 0 — Sol). $\frac{0}{1}$

b) -67 — Sol): $-\frac{67}{1}$

c). 14 — Sol). $\frac{14}{1}$

d) $3 \div (-5)$ — Sol). $\frac{3}{-5}$

Q2): write the following rational numbers in standard form.

a) $\frac{121}{-110}$ — Sol): $\frac{\cancel{121}^{11}}{\cancel{-110}_{10}}$ ⇒ $-11/10$

b): $\frac{-84}{-27}$ — Sol): $\frac{\cancel{-84}^{28}}{\cancel{-27}_{9}}$ ⇒ $28/9$

c): $\frac{-95}{-19}$ — Sol): $\frac{\cancel{-95}^{5}}{\cancel{-19}_{1}}$ ⇒ $\frac{5}{1}$

Q3): write three equivalent rational numbers for each of the following:

a) $\frac{-4}{7}$

c): $\frac{-7}{8}$

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Sol): The three equivalent rational numbers are:

$\frac{-4}{7} \times \frac{2}{2} = \frac{-8}{14}$

$\frac{-4}{7} \times \frac{3}{3} = -\frac{12}{21}$

$\frac{-4}{7} \times \frac{4}{4} = -\frac{16}{28}$

Sol): The three equivalent rational numbers are.

$\frac{7}{8} \times \frac{2}{2} = \frac{14}{16}$

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

$\frac{7}{8} \times \frac{4}{4} = \frac{28}{32}$

Q4): Identify the positive and negative rational numbers.

a): $\frac{4}{5}$ → positive rational number.

b): $-\frac{7}{8}$ → Negative rational number.

c): $\frac{4}{-11}$ → Negative rational number.

e): $\frac{-6}{-14}$ → positive rational number.

Q6): Identify the greater rational number in the given pair.

a) $\frac{4}{7}$ and $\frac{5}{9}$

Sol): $\frac{4}{7}$ and $\frac{5}{9}$

$\Rightarrow 4 \times 9 = 36$

$\Rightarrow 5 \times 7 = 35$

$\Rightarrow 36 > 35$

$\Rightarrow \frac{4}{7} > \frac{5}{9}$

d): $\frac{-4}{11}$ and $-\frac{5}{6}$

Sol): $\frac{-4}{11}$ and $-\frac{5}{6}$

$\Rightarrow -4 \times 6 = -24$

$-5 \times 11 = -55$

$\Rightarrow -24 > -55$

$\Rightarrow -\frac{4}{11} > -\frac{5}{6}$.

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Q7): Arrange the following rational numbers in ascending order.

a) $\frac{4}{5}, \frac{-3}{7}, \frac{-6}{-7}$

Sol): $\frac{4}{5}, \frac{-3}{7}, \frac{6}{7}$

7	5, 7, 7
5	5, 1, 1
	1, 1, 1

lcm of 5, 7, 7 = 35.

$\Rightarrow \frac{4}{5} \times \frac{7}{7} = \frac{28}{35}$

$\Rightarrow \frac{-3}{7} \times \frac{5}{5} = \frac{-15}{35}$

$\Rightarrow \frac{6}{7} \times \frac{5}{5} = \frac{30}{35}$

Comparing numerators we get.

$-15 < 28 < 30$

$\Rightarrow \frac{-3}{7}, \frac{4}{5}, \frac{-6}{-7}$.

c): $\frac{11}{-12}, \frac{0}{5}, \frac{-5}{3}$

Sol): $\frac{-11}{12}, \frac{0}{5}, \frac{-5}{3}$

3	12, 5, 3
2	4, 5, 1
2	2, 5, 1
5	1, 5, 1
	1, 1, 1

lcm of 12, 5 & 3 = 60

$\Rightarrow \frac{-11}{12} \times \frac{5}{5} = \frac{-55}{60}$

$\Rightarrow \frac{0}{5} \times \frac{12}{12} = \frac{0}{60}$

$\Rightarrow \frac{-5}{3} \times \frac{20}{20} = \frac{-100}{60}$

Comparing numerators we get.

$-100 < -55 < 0$

$\Rightarrow \frac{-5}{3}, \frac{11}{-12}, \frac{0}{5}$

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Q8): Arrange the following rational numbers in descending order:

a): $\frac{3}{7}, \frac{-4}{-14}, \frac{-1}{-2}, \frac{8}{7}$

Sol): $\frac{3}{7}, \frac{4}{14}, \frac{1}{2}, \frac{8}{7}$

lcm of 7, 14, 2 and 7 = 14.

7	7, 14, 2, 7
2	1, 2, 2, 1
	1, 1, 1, 1

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

$\Rightarrow \frac{4}{14} \times \frac{1}{1} = \frac{4}{14}$

$\Rightarrow \frac{1}{2} \times \frac{7}{7} = \frac{7}{14}$

$\Rightarrow \frac{8}{7} \times \frac{2}{2} = \frac{16}{14}.$

Comparing numerators we get.

$16 > 7 > 6 > 4$

$\Rightarrow \frac{8}{7}, \frac{-1}{-2}, \frac{3}{7}, \frac{-4}{-14}.$

c): $\frac{5}{-6}, \frac{-5}{8}, \frac{-6}{-12}, \frac{-3}{4}$

Sol): $-\frac{5}{6}, \frac{-5}{8}, \frac{6}{12}, \frac{-3}{4}$

lcm of 6, 8, 12, 4 = 24

3	6, 8, 12, 4
2	2, 8, 4, 4
2	1, 4, 2, 2
2	1, 2, 1, 1
	1, 1, 1, 1

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

$\Rightarrow -\frac{5}{8} \times \frac{3}{3} = -\frac{15}{24}$

$\Rightarrow \frac{6}{12} \times \frac{2}{2} = \frac{12}{24}$

$\Rightarrow -\frac{3}{4} \times \frac{6}{6} = -\frac{18}{24}.$

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Comparing numerators we get.

$12 > -15 > -18 > -20$

$\Rightarrow \frac{-6}{-12} > \frac{-5}{8}, \frac{-3}{4}, \frac{-5}{6}.$

Q9): Fill in the blanks with $<, >$ or $=$ sign.

a) $\frac{-4}{-16} \_\_\_ \frac{-3}{2}$

$\Rightarrow \frac{4}{16} > \frac{-3}{2}$ — [∵ +ive numbers are greater than −ive numbers.

b): $\frac{-4}{9} \_\_\_ \frac{16}{-36}$

Sol): $-4 \times -36 = 144$

$9 \times 16 = 144$

$\Rightarrow \frac{-4}{9} = \frac{16}{-36}$

c): $\frac{3}{5} \_\_\_ \frac{+4}{+7}$

Sol): $3 \times +7 = +21$

$+4 \times 5 = +20$

$\Rightarrow \frac{3}{5} < > \frac{+4}{+7}$

d): $\frac{11}{15} \_\_\_ \frac{16}{19}$

Sol): $11 \times 19 = 209$

$16 \times 15 = 240$

$\Rightarrow \frac{11}{15} < \frac{16}{19}$

Q10): Find the absolute value of the following:

a): $\frac{3}{13}$

Sol): $|3/13|$

$\Rightarrow 3/13$

b): $\frac{-5}{16}$

Sol): $|-5/16|$

$\Rightarrow 5/16$

c): $\frac{2}{-11}$

Sol): $|2/-11|$

$\Rightarrow 2/11$

d): $\frac{-7}{-15}$

Sol): $|-7/-15|$

$\Rightarrow 7/15.$

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Exercise No: 3.2

Q1): Add the following rational numbers:

a): $\frac{4}{9}$ and $\frac{-7}{9}$

Sol): $\frac{4}{9} + \frac{(-7)}{9}$

$\Rightarrow \frac{4+(-7)}{9}$

$\Rightarrow \frac{4-7}{9}$

$\Rightarrow \frac{-3}{9_3}$

$\Rightarrow \frac{-1}{3}$

c): $\frac{-7}{11}$ and $\frac{9}{11}$

Sol): $\frac{-7}{11} + \frac{9}{11}$

$\Rightarrow \frac{-7+9}{11}$

$\Rightarrow \frac{2}{11}$.

Q2): Find the Sum.

a): $\frac{4}{7} + \frac{3}{4}$

Sol): $\frac{4}{7} + \frac{3}{4}$

$\Rightarrow \frac{(4\times4)+(3\times7)}{(7\times4)}$

$\Rightarrow \frac{16+21}{28}$

$\Rightarrow \frac{37}{28}$

$\Rightarrow 1\frac{9}{28}$.

c): $\frac{-14}{15} + \frac{7}{5}$

Sol): $\frac{-14}{15} + \frac{7}{5}$

lcm of 5 & 15 = 15

$\Rightarrow \frac{(-14\times1)+(7\times3)}{15}$

$\Rightarrow \frac{-14+21}{15}$

$\Rightarrow \frac{7}{15}$.

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Q3): Subtract.

a) $\frac{-3}{4}$ from $\frac{1}{2}$

Sol): $\frac{1}{2} - \left(\frac{-3}{4}\right)$.

$\Rightarrow \frac{1}{2} + \frac{3}{4}$

$\Rightarrow \frac{(1\times2) + (3\times1)}{4}$

$\Rightarrow \frac{2+3}{4}$

$\Rightarrow \frac{5}{4} \Rightarrow 1\frac{1}{4}$.

c): $\frac{4}{17}$ from $\frac{-8}{34}$

Sol): $\frac{-8}{34} - \frac{4}{17}$

$\Rightarrow \frac{(-8\times1) - (4\times2)}{34}$

$\Rightarrow \frac{-8 - 8}{34}$

$\Rightarrow -\frac{16}{34}\ \frac{8}{17}$

$\Rightarrow \frac{-8}{17}$.

Q4): Solve the following.

a) $\frac{4}{7} - \frac{-3}{8}$

Sol): $\frac{4}{7} + \frac{3}{8}$

$\Rightarrow \frac{(4\times8) + (3\times7)}{7\times8}$

$\Rightarrow \frac{32 + 21}{56}$

$\Rightarrow \frac{53}{56}$

c): $\frac{15}{16} + \frac{-7}{8}$

Sol): $\frac{15}{16} - \frac{7}{8}$

$\Rightarrow \frac{(15\times1) - (7\times2)}{16}$

$\Rightarrow \frac{15 - 14}{16}$

$\Rightarrow \frac{1}{16}$.

Q5): Simplify:

a): $\frac{3}{4} + \frac{-14}{9} - \frac{7}{4}$

Sol): $\frac{3}{4} - \frac{4}{9} - \frac{7}{4}$

d): $3\frac{1}{4} + \frac{7}{12} - \frac{5}{6}$

Sol): $\frac{13}{4} + \frac{7}{12} - \frac{5}{6}$

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⇒ lcm of 9, 4, 4 = 36

⇒ $\frac{(3\times9)-(4\times4)-(7\times9)}{36}$

⇒ $\frac{27-16-63}{36}$

⇒ $\frac{27-79}{36}$

⇒ $-\frac{52}{36}\ \frac{13}{9}$

⇒ $-\frac{13}{9}$

lcm of 4, 12, 6 = 12

⇒ $\frac{(13\times3)+(7\times1)-(5\times2)}{12}$

⇒ $\frac{39+7-10}{12}$

⇒ $\frac{46-10}{12}$

⇒ $\frac{36}{12}\ \frac{3}{1}$

⇒ 3.

f): $-\frac{22}{16}\times\left(\frac{16}{22}-\frac{3}{11}\right)$

Sol): $-\frac{22}{16}\times\left(\frac{16}{22}-\frac{3}{11}\right)$

⇒ $-\frac{22}{16}\times\left[\frac{(16\times1)-(3\times2)}{22}\right]$

⇒ $-\frac{22}{16}\times\left(\frac{16-6}{22}\right)$

⇒ $-\frac{22}{16}\times\frac{16}{22}\ \frac{5}{8}$

⇒ $-\frac{5}{8}$

h): $-\frac{7}{12}\times\left(\frac{6}{7}\div\frac{5}{6}\right)$

Sol): $-\frac{7}{12}\times\left(\frac{6}{7}\div\frac{5}{6}\right)$

⇒ $-\frac{7}{12_2}\times\frac{6^1}{7}\times\frac{6}{5}$

⇒ $-\frac{1}{2_1}\times\frac{1}{1}\times\frac{6}{5}\ ^3$

⇒ $-\frac{3}{5}$.

Q6): Find the product of the following:

a): $-\frac{14}{15}\times\frac{5}{24}$

Sol): $-\frac{{}^{7}14}{15_3}\times\frac{5^1}{24_{12}}$

d): $\frac{17}{68}\times\frac{7}{28}\times\frac{15}{10}$

Sol): $\frac{{}^{1}17}{68_4}\times\frac{7^1}{28_4}\times\frac{15^3}{10_2}$

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$\Rightarrow \frac{-7}{3} \times \frac{1}{12}$

$\Rightarrow \frac{-7}{36}$.

$\Rightarrow \frac{1}{4} \times \frac{1}{4} \times \frac{3}{2}$

$\Rightarrow \frac{3}{32}$

Q7): Find the quotient of the following:

a) $\frac{9}{10} \div \frac{1}{5}$

Sol): $\frac{9}{10} \div \frac{1}{5}$

$\Rightarrow \frac{9}{\cancel{10}_2} \times \frac{\cancel{5}^1}{1}$

$\Rightarrow \frac{9}{2}$

b): $\frac{-6}{7} \div \frac{4}{14}$

Sol): $\frac{-6}{7} \div \frac{4}{14}$

$\Rightarrow \frac{\cancel{-6}^3}{\cancel{7}_1} \times \frac{\cancel{14}^2}{\cancel{4}_2}$

$\Rightarrow -3$

c): $-11\frac{1}{2} \div 23$

Sol): $\frac{-23}{2} \div \frac{23}{1}$

$\Rightarrow -\frac{\cancel{23}}{2} \times \frac{1}{\cancel{23}}$

$\Rightarrow -\frac{1}{2}$

d): $\frac{-18}{20} \div \frac{75}{15}$

Sol): $\frac{-18}{20} \div \frac{75}{15}$

$\Rightarrow -\frac{\cancel{18}^6}{20} \times \frac{\cancel{15}^3}{\cancel{75}\ \cancel{15}_5}$

$\Rightarrow \frac{\cancel{-6}^3}{\cancel{20}_{10}} \times \frac{3}{5}$

$\Rightarrow -\frac{9}{50}$

Q8): Find two rational numbers between $1/2$ and $4/3$.

Sol): Lcm of 2 and 3 = 6.

So, $\frac{1}{2} \times \frac{3}{3} = \frac{3}{6}$ & $\frac{4}{3} \times \frac{2}{2} = \frac{8}{6}$.

So, it is clearly seen that integers 4, 5, 6, 7 lies between 3 and 8. Thus rational no's. between $1/2$ and $4/3$ are $4/6$, $5/6$, $6/6$, $7/6$.

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Exercise No.:⇒ 3.3

Terminating and Non-Terminating Decimals:⇒

A Terminating decimal is a decimal, That has an end digit. It is a decimal, which has a finite number of digits (or Terms) for example: 0.15, 0.86, etc. Non-Terminating decimals are the One That does not have an end Term. It has an infinite number of terms eg. 0.1555..... , 0.666.... etc.

Q1)⇒ Without finding the decimal representation, State whether the following rational numbers are Terminating decimals or non-terminating decimals.

Sol) a): $\frac{5}{12}$

Sol)⇒ $5/12$

$\Rightarrow \frac{5}{2\times2\times3}$

$\Rightarrow \frac{5}{2^2\times3}$

⇒ Non-Terminating.

2	12
2	6
3	3
	1

Rational No. $\frac{p}{q}$ → Terminating if $q = 2^m \times 5^n$

→ Non-Terminating if $q = 2^m \times 5^n \times k$

[m, n → integers

[k → prime factors other than 2 or 5].

c) 49/50

Sol): $\frac{49}{5\times5\times2}$

$\Rightarrow \frac{49}{2^1\times5^2}$

⇒ Terminating

g): −26/25

Sol): $\frac{-26}{5\times5}$

$\Rightarrow -26/(5)^2$ → Terminating

f): 9/4

Sol): $\frac{9}{2\times2}$

$\Rightarrow \frac{9}{2^1\times7^1}$

⇒ Non-Terminating

h): 83/12

Sol): $\frac{8}{2\times2\times3}$

$\Rightarrow 8/(2)^2\times(3)^1$ → N-Terminating

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Q2): Express the following rational numbers as decimals, and state which of them are Terminating or Non-Terminating repeating decimals.

a): 5/11.

Sol):
$$\begin{array}{r|l} 11 & 50 \\ & 44 \\ \hline & 60 \\ & 55 \\ \hline & 50 \\ & 44 \\ \hline & 60 \\ & 55 \\ \hline & 5 \end{array} \quad 0.4545\ldots$$

⇒ Non-Terminating repeating decimal.

c): −18/256

Sol):
$$\begin{array}{r|l} 256 & 1800 \\ & 1792 \\ \hline & 800 \\ & 768 \\ \hline & 320 \\ & 256 \\ \hline & 640 \\ & 512 \\ \hline & 1280 \\ & 1280 \\ \hline & \times \end{array} \quad 0.0703125$$

⇒ Terminating decimal.

e): 201/125

Sol):
$$\begin{array}{r|l} 125 & 201 \\ & 125 \\ \hline & 760 \\ & 750 \\ \hline & 1000 \\ & 1000 \\ \hline & \times \end{array} \quad 1.608$$

⇒ Terminating decimal.

g): 45/−230

Sol):
$$\begin{array}{r|l} 230 & 450 \\ & 230 \\ \hline & 2200 \\ & 2070 \\ \hline & 1300 \\ & 1150 \\ \hline & 1500 \\ & 1380 \\ \hline & 1200 \\ & 1150 \\ \hline & 50 \end{array} \quad 0.19565$$

⇒ Non-Terminating decimal.

Q3): Express the following as rational numbers.

a): 0.25

Sol): $\frac{25}{100} \Rightarrow \frac{1}{4}$

b): 0.013

Sol): $\frac{13}{1000}$

c): −0.168

Sol): $-\frac{168}{1000} \Rightarrow -\frac{21}{125}$

d): 0.0021

Sol): $\frac{21}{10000}$

e): 0.145

Sol): $\frac{145}{1000} \Rightarrow \frac{29}{200}$

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Q4):- Convert the following decimals into rational numbers.

a): $0.\overline{016}$

Sol): let $x = 0.0\overline{16}$ —i

Multiply it by 10 so, that we left with only decimal part.

$\Rightarrow 10x = 00.\overline{16}$ —ii

Now, two digits are repeating, so we multiply it again with 100.

$\Rightarrow 10x \times 100 = 00.\overline{16} \times 100$

$\Rightarrow 1000x = 16.\overline{16}$ — (iii)

Subtract (2) from (3) we get.

$\Rightarrow 1000x - 10x = 16.\overline{16} - 00.\overline{16}$

$\Rightarrow 990x = 16$

$\Rightarrow x = \frac{16}{990}^{8} \Rightarrow \frac{8}{495}$

b) $0.\overline{3}$

Sol): let $x = 0.\overline{3}$

$\Rightarrow x = 0.333...$ —(i)

Multiply both sides with 10. we get.

$\Rightarrow 10x = 0.\overset{\rightarrow}{3}33... \times 10$

$\Rightarrow 10x = 3.333...$ —(ii)

Now subtraction (i) from (ii)

$10x = 3.333...$

$- x \quad - 0.333...$

$\Rightarrow 9x = 3$

$\Rightarrow x = \frac{3^{1}}{9_{3}}$

$\Rightarrow x = 1/3.$

Part (c) is same as part (a) and part (d) is same as part (b). do yourself.

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Q5): what should be added to $\left(\frac{1}{4}+\frac{1}{5}+\frac{1}{6}\right)$ to get 8?

Sol): Let the number added be p/q.

Ac. to Q.

$$\Rightarrow \left(\frac{1}{4}+\frac{1}{5}+\frac{1}{6}\right)+\frac{p}{q}=8.$$

lcm of 4, 5, 6 is 60.

$$\Rightarrow \left[\frac{(1\times15)+(1\times12)+(1\times10)}{60}\right]+\frac{p}{q}=8$$

$$\Rightarrow \left(\frac{15+12+10}{60}\right)+\frac{p}{q}=8$$

$$\Rightarrow \frac{37}{60}+\frac{p}{q}=8$$

$$\Rightarrow \frac{p}{q}=\frac{8}{1}-\frac{37}{60}$$

$$\Rightarrow \frac{p}{q}=\frac{(8\times60)-(1\times37)}{1\times60}$$

$$\Rightarrow \frac{p}{q}=\frac{480-37}{60}$$

$$\Rightarrow \frac{p}{q}=\frac{443}{60}.$$

∴ The req. number is $\frac{443}{60}$

Q6): Evaluate:

a): $2.\overline{8}+3.\overline{5}$

Sol): Let $x = 2.\overline{8}$

$\Rightarrow x = 2.88\ldots$ —(i)

Multiply b/s with 10

$\Rightarrow 10x = 2.\overline{88}\ldots \times 10$

Let $x = 3.\overline{5}$

$\Rightarrow x = 3.55\ldots$ —(i)

Multiply b/s with 10

$\Rightarrow 10x = 3.\overline{55}\ldots \times 10$

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$\Rightarrow 10x = 28.0\ldots$ —ii

Substract (i) from (ii)

$10x = 28.000\ldots$

$-x \quad -2.000\ldots$

$9x = 26$

$x = \frac{26}{9}$

$\Rightarrow 10x = 35.55\ldots$ —ii

Sub. (i) from (ii)

$10x = 35.55\ldots$

$-x \quad -3.55\ldots$

$9x = 32$

$x = \frac{32}{9}$

Now $\frac{26}{9} + \frac{32}{9}$

$\Rightarrow \frac{26+32}{9} \Rightarrow \frac{58}{9} \Rightarrow 6\frac{4}{9}$.

Q8): Rashi earns ₹ 18,000 per month. She spends 1/4 of her income on groceries, 2/25 of the remainder on medicine and 1/3 of the remainder on the education of children. How many money is still left with her?

Sol): Total earning = ₹ 18,000.

Money spend on groceries = $\frac{1}{4}$ of income

$= \frac{1}{4_1} \times \frac{18{,}000}{} \quad 4500$

$= ₹\ 4500.$

Now money left = $18{,}000 - 4500 = ₹\ 13500.$

Now Money spend on medicine = $\frac{2}{25}$ of left income

$= \frac{2}{25_1} \times \frac{13500}{} \quad 540$

$= ₹\ 1080.$

Now income left = $13500 - 1080 = ₹\ 12420.$

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Now money spended on education = $\frac{1}{3}$ of left income

$$= \frac{1}{3_1} \times \cancel{12420}\ 4140$$

$$= 4140.$$

∴ Money still left = $12420 - 4140 = ₹\ 8280.$

Q9): The product of two rational numbers is $\frac{18}{35}$. If one of them is $-\frac{8}{7}$, find the other?

Sol): Let the another rational number be $\frac{p}{q}$.

Ac. to Q

$$-\frac{8}{7} \times \frac{p}{q} = \frac{18}{35}$$

$$\Rightarrow \frac{p}{q} = \frac{18}{35} \div \frac{-8}{7}$$

$$\Rightarrow \frac{p}{q} = \frac{\overset{9}{\cancel{18}}}{\underset{5}{\cancel{35}}} \times \frac{7^{1}}{-\cancel{8}_{4}}$$

$$\Rightarrow \frac{p}{q} = \frac{-9}{20}$$

∴ The Regd. number is $-9/20$.

Q10): Two pieces of lengths $\frac{9}{11}$ m and $\frac{13}{22}$ m are cut from a 2m long rope. What is the length of the remaining rope.?

Sol): Total length of rope = 2m

Pieces cut are $9/11$ m and $13/22$ m.

Ac. to Q.

$$2 - \left(\frac{9}{11} + \frac{13}{22}\right).$$

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$\Rightarrow \quad 2 - \left(\frac{(9\times2)+(13\times1)}{22}\right)$.

$\Rightarrow \quad 2 - \left(\frac{18+13}{22}\right)$

$\Rightarrow \quad \frac{2}{1} - \frac{31}{22}$

$\Rightarrow \quad \frac{(2\times22)-(31\times1)}{1\times22}$

$\Rightarrow \quad \frac{44-31}{22}$

$\Rightarrow \quad \frac{13}{22}$ m.

$\therefore$ length of rope left is 13/22 m.

Q11):- By what number should we divide $\frac{13}{15}$ to get $\frac{2}{25}$?

Sol):- let the number be p/q.

Ac. to Q.

$$\frac{13}{15} \div \frac{p}{q} = \frac{2}{25}$$

$\Rightarrow \quad \frac{13}{15} \times q/p = \frac{2}{25}$

$\Rightarrow \quad q/p = \frac{2}{\cancel{25}_{5}} \times \frac{\cancel{15}^{3}}{13} = \frac{6}{65}$

$\Rightarrow \quad p/q = \frac{65}{6}$

$\Rightarrow$ or $\frac{p}{q} = 10\frac{5}{6}$.

$\therefore$ Reqd. rational number is $10\frac{5}{6}$.

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PROPERTIES OF TRIANGLES

Chapter No: 10

Triangles :⇒ A Triangle is a Three-sided figure formed by joining three line segments together at their endpoints. A Triangle has three sides, three vertices, three angles.

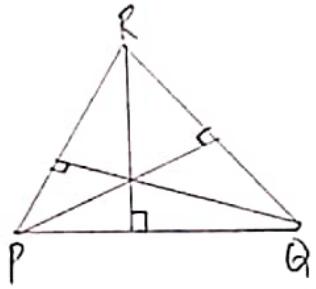
Collinear Points :⇒ are points that all lie in the same line, whether they are close together or far apart

RECAP EXERCISE

1)⇒ State True or false : A Triangle is formed by joining three collinear points → false.

2)⇒ Draw a rough sketch of △ PQR. Draw the altitudes of the Triangle.

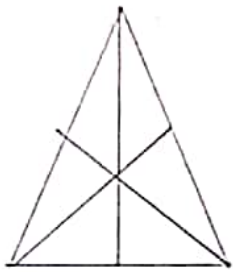
Sol)⇒



3)⇒ Fill in the blanks : A Triangle has 3 vertices and 3 angles.

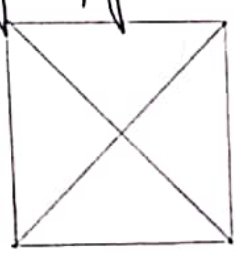
4)⇒ Count the Triangles in the following figures:

a):



11 Triangles

b):



8 Triangles

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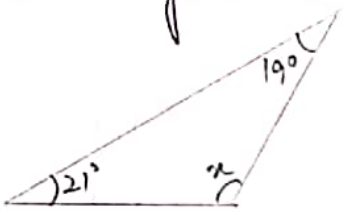
Angle Sum Property of a Triangle :⇒ This property states that the sum of three angles of a triangle is 180°.

Exterior angle Property :⇒ The exterior angle of a triangle is equal to the sum of its two opposite interior angles.

Exercise No : 10.1

Q1):⇒ Find the measures of each of the unknown angles denoted by the letters of English alphabet.

a):



Sol): As per ASP.

$\Rightarrow 21^\circ + x + 19^\circ = 180^\circ$

$\Rightarrow 40^\circ + x = 180^\circ$

$\Rightarrow x = 180^\circ - 40^\circ$

$\Rightarrow x = 140^\circ$

b):

Sol): As per ASP.

$x + x + 50^\circ = 180^\circ$

$\Rightarrow 2x + 50^\circ = 180^\circ$

$\Rightarrow 2x = 180^\circ - 50^\circ$

$\Rightarrow 2x = 130^\circ$

$\Rightarrow x = \frac{130^\circ}{2} = 65^\circ$

$\Rightarrow x = 65^\circ$

c):⇒

Sol): As per ASP.

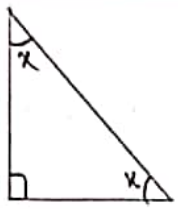
$90^\circ + 40^\circ + a = 180^\circ$

$\Rightarrow 130^\circ + a = 180^\circ$

$\Rightarrow a = 180^\circ - 130^\circ$

$\Rightarrow a = 50^\circ$

d):⇒



Sol): As per ASP.

$90^\circ + x + x = 180^\circ$

$\Rightarrow 90^\circ + 2x = 180^\circ$

$\Rightarrow 2x = 180^\circ - 90^\circ$

$\Rightarrow 2x = 90^\circ$

$\Rightarrow x = \frac{90}{2} = 45^\circ$

$\Rightarrow x = 45^\circ$

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Q2):⇒ Find the values of x if the three angles of a Triangle are:

a) x, 2x, 3x.

Sol):⇒ $x + 2x + 3x = 180^\circ$ —(ASP)

$\Rightarrow 6x = 180^\circ$

$\Rightarrow x = \frac{180}{6_1}^{30^\circ}$

$\Rightarrow x = 30^\circ$

∴ 1st angle $= x \Rightarrow 30^\circ$

2nd angle $= 2x$

$= 2(30^\circ) \Rightarrow 60^\circ$

⇒ 3rd angle $= 3x$

$= 3(30) = 90^\circ$

b):⇒ $3x, x/2, 5x/2$

Sol):⇒ $\frac{3x}{1} + \frac{x}{2} + \frac{5x}{2} = 180^\circ$

$\Rightarrow \frac{(3\times2)x + x + 5x}{2} = 180^\circ$

$\Rightarrow \frac{6x + x + 5x}{2} = 180^\circ$

$\Rightarrow \frac{\overset{6}{\cancel{12}}x}{\cancel{2}_1} = 180^\circ$

$\Rightarrow 6x = 180^\circ$

$\Rightarrow x = \frac{180^\circ}{\cancel{6}_1}\ 30^\circ$

$\Rightarrow x = 30^\circ$

Q3 and Q4 same as Q1.

Q5):⇒ The angles of a Triangle are in the ratio of 2:3:5. find the angles. what type of Triangle is it?

Sol):⇒ let the measures of angles be 2x, 3x and 5x.

Ac. to Q.

$2x + 3x + 5x = 180^\circ$ — ASP.

$\Rightarrow 10x = 180^\circ$

$\Rightarrow x = \frac{180^\circ}{10}$

$\Rightarrow x = 18^\circ.$

∴ 1st angle $= 2x \Rightarrow 2(18^\circ) = 36^\circ$

2nd angle $= 3x \Rightarrow 3(18^\circ) = 54^\circ$

3rd angle $= 5x \Rightarrow 5(18^\circ) = 90^\circ$

∴ It's right-angled Triangle.

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Q6): Find the measure of each angle of an equilateral triangle.

Sol): Let the measure of each angle be x.

Ac. to Q

$$x + x + x = 180^\circ \quad \text{— ASP}$$

$$\Rightarrow \quad 3x = 180^\circ$$

$$\Rightarrow \quad x = \frac{\cancel{180}}{\cancel{3}_1} \; 60^\circ$$

$$\Rightarrow \quad x = 60^\circ$$

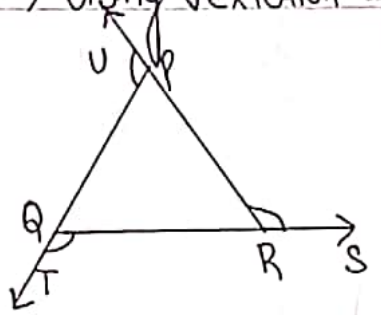
$\therefore$ Each angle of equilateral triangle is equal to 60°

Q7): Fill in the blanks with the help of figure.

a): $\angle PRS = \underline{\angle QPR} + \underline{\angle PQR}$ → Using exterior angle pro.

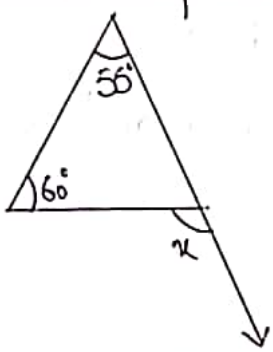
b): $\angle QPU = \underline{\angle PQR} + \underline{\angle PRQ}$

c): $\angle RQT = \underline{\angle QPR} + \underline{\angle PRQ}$



Q8): In the following figure find x and y.

a):

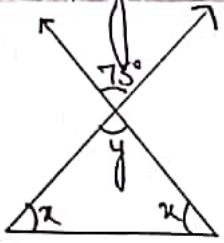


Sol): Using exterior angle property we get

$$\Rightarrow \quad x = 60^\circ + 55^\circ$$

$$\Rightarrow \quad x = 115^\circ$$

c):



Sol): $y = 75^\circ$ — Vertically opp. $\angle$s

Now using ASP.

$$\Rightarrow \quad x + x + y = 180^\circ$$

$$\Rightarrow \quad 2x + 75^\circ = 180^\circ$$

$$\Rightarrow \quad 2x = 180^\circ - 75^\circ$$

$$\Rightarrow \quad 2x = 105^\circ$$

$$\Rightarrow \quad x = \frac{105}{\cancel{2}_1} \; 52.5^\circ$$

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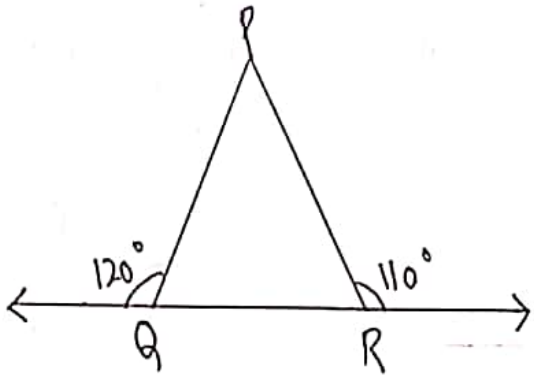
Q9) :⇒ In the given figure find angle P.

Sol) :⇒ We know

$\angle PQR = 180^\circ - 120^\circ$ — st. angle is 180°

$= 60^\circ$



also $\angle PRQ = 180^\circ - 110^\circ \Rightarrow 70^\circ$

Now in $\triangle PQR$.

$\angle P + \angle PQR + \angle PRR = 180^\circ$ — ASP

$\Rightarrow \angle P + 60^\circ + 70^\circ = 180^\circ$

$\Rightarrow \angle P + 130^\circ = 180^\circ$

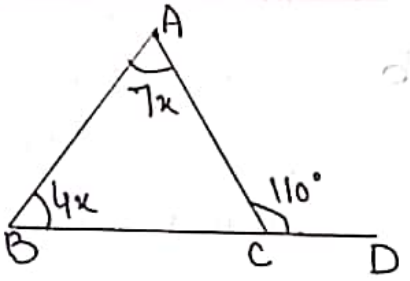
$\Rightarrow \angle P = 180^\circ - 130^\circ$

$\Rightarrow \angle P = 50^\circ$

Q10) :⇒ The exterior angle $\angle ACD$ of $\triangle ABC$ is 110° and $\angle A$ & $\angle B$ are in the ratio 7:4. find all the angles of $\triangle ABC$.

Sol) :⇒ We know.

$\angle ACD = \angle A + \angle B$ — [ext. angle]



$\Rightarrow 110^\circ = 7x + 4x$

$\Rightarrow 110^\circ = 11x$

or $11x = 110^\circ$

$\Rightarrow x = \frac{\cancel{110}^{10}}{\cancel{11}_1}$

$\Rightarrow x = 10^\circ$.

$\therefore \angle A = 7x$

$= 7(10) = 70^\circ$

$\angle B = 4x$

$= 4(10) = 40^\circ$

$\angle C = 180^\circ - \angle ACD$ — st. angle

$= 180^\circ - 110^\circ \Rightarrow 70^\circ$.

→ Q11 is same as Q8.

→ Q12 is same as Q9. [do it by yourself].

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Triangle Inequality Property :⇒ The Triangle inequality property states that in any Triangle, the sum of any two sides must be greater than the third side.

Pythagoras Theorem :⇒ It states that the square of the hypotenuse of a rt. angled Triangle is equal to the sum of the squares of the other two sides.

i,e $(Hyp)^2 = (per)^2 + (base)^2$.

Exercise No. :⇒ 10.2

Q1) :⇒ Which of the following can form a Triangle.

a) 7cm, 10cm, 7cm.

Sol) :⇒ Using Triangle ineq. property we get.

7cm + 10cm = 17cm > 7cm.

also 7cm + 7cm = 14cm > 10cm.

∴ Triangle is possible.

B) 3cm, 3.5cm, 8cm.

Sol) :⇒ Using Triangle ineq. property we get.

3cm + 3.5cm = 6.5cm < 8cm.

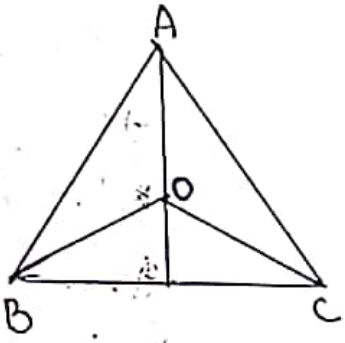
∴ Triangle is not possible.

Q2) :⇒ In △ ABC, O is the point in the interior of the Triangle. State whether the following statements are True or false.

a) : OA + OB > AB → True

b) : OB + OC = BC → false

c) : OA + OC < AC → false.

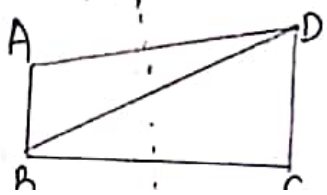


Q3) :⇒ Which of the following is the shortest distance from A to B!

a) : A to B directly

b) : A to B via D

c) : A to B via C.



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Q4) :⇒ Determine whether a Triangle with the given measures is a rt. angled Triangle or not.?

a): 4cm, 6cm, 8cm.

Sol):⇒ let P = 4cm, B = 6cm, H = 8cm. [∵ hypotenuse is the longest side.

∴ By using pythagorean theorem.

$(Hyp)^2 = (Per)^2 + (Base)^2$

$\Rightarrow (8cm)^2 = (4cm)^2 + (6cm)^2$

$\Rightarrow (8cm \times 8cm) = (4cm \times 4cm) + (6cm \times 6cm)$.

$\Rightarrow 64cm^2 = 16cm^2 + 36cm^2$

$\Rightarrow 64cm^2 \neq 52cm^2$

∴ The Triangle with the given sides is not a rt. angled Triangle.

d):⇒ 6cm, 8cm, 10cm.

Sol):⇒ let P = 6cm, B = 8cm & H = 10cm

By using pythagorean theorem.

$(Hyp)^2 = (Per)^2 + (Base)^2$

$\Rightarrow (10cm)^2 = (6cm)^2 + (8cm)^2$

$\Rightarrow 10cm \times 10cm = (6cm \times 6cm) + (8cm \times 8cm)$

$\Rightarrow 100cm^2 = 36cm^2 + 64cm^2$

$\Rightarrow 100cm^2 = 100cm^2$.

∴ The Triangle with the given sides is a rt. angled △.

Q5) :⇒ which of the following are pythagorean triplets?

a): 12, 16, 20.

Sol):⇒ $(12)^2 = 144$

$\Rightarrow (16)^2 = 256$

$\Rightarrow (20)^2 = 400$

Now $144 + 256 = 400$

⇒ 12, 16, 20 are pythagorean triplets

d): 7, 8, 9

Sol):⇒ $(7)^2 = 49$

$\Rightarrow (8)^2 = 64$

$\Rightarrow (9)^2 = 81$

$\Rightarrow 49 + 64 = 113$

$\Rightarrow 113 \neq 81$.

⇒ 7, 8, 9 are not pyt. triplets.

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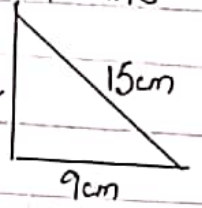
Q6):⇒ Find the missing sides of the following rt. Triangles.

a):



Sol):⇒ Perp = x

⇒ Base = 9cm

⇒ Hyp = 15cm.

Using Pyth. theorem.

$(Hyp)^2 = (Perp)^2 + (Base)^2$

$\Rightarrow (15cm)^2 = (x)^2 + (9cm)^2$

$\Rightarrow 225cm^2 = x^2 + 81cm^2$

$\Rightarrow 225cm^2 - 81cm^2 = x^2$

$\Rightarrow 144cm^2 = x^2$

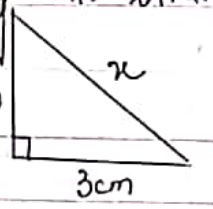
OR $x^2 = 144cm^2$

$\Rightarrow x^2 = (12cm)^2$

$\Rightarrow x = 12cm$

∴ Perpendicular = 12cm.

c):



Sol):⇒ Perp = 4cm

Base = 3cm

Hyp = x

Using Pyth. theorem

$(Hyp)^2 = (Perp)^2 + (Base)^2$

$(x)^2 = (4cm)^2 + (3cm)^2$

$x^2 = 16cm^2 + 9cm^2$

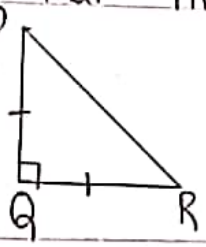
$x^2 = 25cm^2$

$x^2 = (5cm)^2$

$x = 5cm.$

∴ Hypotenuse = 5cm.

Q7):⇒ PQR is a isosceles rt. angled triangle, rt-angled at Q. Prove that $PR^2 = 2PQ^2$



Sol):⇒ △ PQR is an isos. rt. ∠ △.

⇒ PQ = QR.

Using Pythagoream theorem.

$(Hyp)^2 = (Perp)^2 + (Base)^2$

$\Rightarrow (PR)^2 = (PQ)^2 + (QR)^2$

$\Rightarrow (PR)^2 = (PQ)^2 + (PQ)^2$

$\Rightarrow (PR)^2 = 2(PQ)^2$

Hence Proved

Q8):⇒ The sides of a Triangle are of length 6cm, 4.5cm & 7.5cm. Is it a rt. angled? If yes, then find the measure of its hypotenuse.

Sol):⇒ $(6cm)^2 = 36cm^2$

$\Rightarrow (4.5cm)^2 = 20.25cm^2$

$\Rightarrow (7.5cm)^2 = 56.25cm^2$

$\Rightarrow 36 + 20.25 = 56.25$

⇒ Yes, it is a rt. angled Triangle with hypotenuse 7.5cm.

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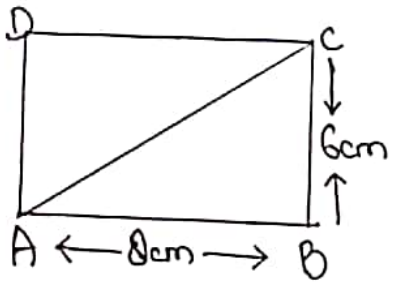
Q9):→ The length and breadth of a rectangle are 8cm and 6cm resp. find the length of the diagonals.

Sol):→ let ABCD be a rectangle with
length = 8cm
and breadth = 6cm.
& diagonal = ?



Now △ ABC is a rt. angled triangle.
By using pythagorean theorem.

$(Hyp)^2 = (per)^2 + (base)^2$

$\Rightarrow (AC)^2 = (BC)^2 + (AB)^2$

$\Rightarrow (Ac)^2 = (6cm)^2 + (8cm)^2$

$\Rightarrow (Ac)^2 = 36cm^2 + 64cm^2$

$\Rightarrow (Ac)^2 = 100\,cm^2$

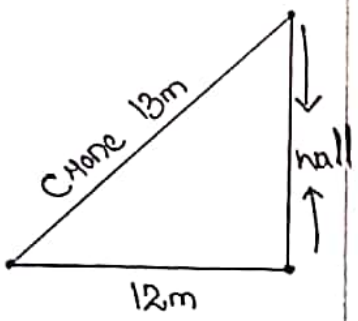
$\Rightarrow (Ac)^2 = (10cm)^2$

$\Rightarrow Ac = 10\,cm.$

∴ length of diagonal is 10 cm.

Q10):→ If a 13m chane is placed 12m away from the wall, then how high is the wall?

Sol):→ length of chane = 13m
Distance b/w chane & wall = 12m
let length of wall = x m.
∴ It forms a rt. angle triangle.
By using pythagorean theorem.



$(Hyp)^2 = (per)^2 + (base)^2$

$\Rightarrow (13m)^2 = (x)^2 + (12m)^2$

$\Rightarrow 169m^2 = x^2 + 144m^2$

$\Rightarrow 169m^2 - 144m^2 = x^2$

$\Rightarrow 25m^2 = x^2$

$\Rightarrow (5m)^2 = x^2$

$\rightarrow x = 5m.$ ∴ length of wall is 5m.

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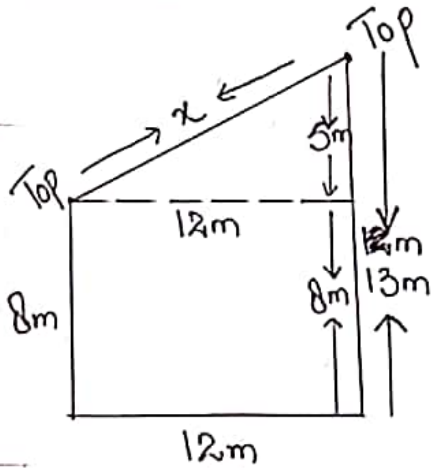
Q11):⇒ Two poles 8m and 13m high are standing 12m apart. Find the distance between their Tops.

Sol):⇒ length of poles are 8m & 13m resp.
distance between poles is 12m.
let the distance between their Tops be x.
It forms a rt. angled Triangle.
in which base = 12m
& perp. = 5m.



By using pythagorean theorem.

$(Hyp)^2 = (perp)^2 + (base)^2$

$\Rightarrow (x)^2 = (5m)^2 + (12m)^2$

$\Rightarrow (x)^2 = 25m^2 + 144m^2$

$\Rightarrow (x)^2 = 169m^2$

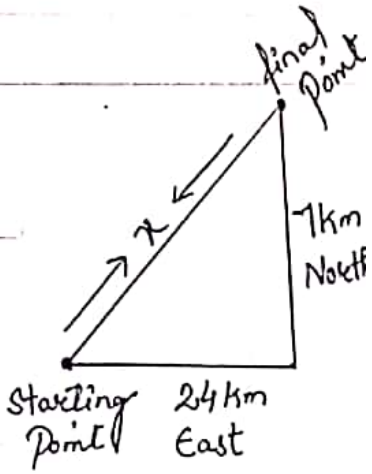
$\Rightarrow (x)^2 = (13m)^2$

$\Rightarrow x = 13m.$

∴ Distance between their Tops is 13m.

Q12):⇒ Ravi walks 24 km towards east and then 7km towards north. find the distance between the starting point and the final position?

Sol):⇒ Distance towards east = 24km
Distance towards North = 7km.
let the distance between starting and final position be x.
Using pythagorean theorem.



$(Hyp)^2 = (perp)^2 + (base)^2$

$\Rightarrow (x)^2 = (7km)^2 + (24km)^2$

$\Rightarrow (x^2) = 49km^2 + 576km^2$

$\Rightarrow (x^2) = 625km^2$

$\Rightarrow (x)^2 = (25km)^2$

$\Rightarrow x = 25km.$ ∴ Reqd. distance is 25km.

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