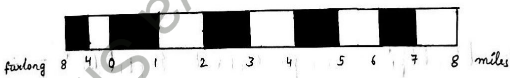
Ans-1

R.F. = 1/100,000



Simple Scale

Q1. The R.F. is 1/100,000. Construct a scale to show miles.

⇒ 1 inch distance on map = 100,000 inch distance on ground.

∴ 1 mile = 63,360 inches

1 inch distance on map = $\frac{100,000}{63,360}$ miles distance on ground.

1 inch distance on map = 1.5 miles on ground

We have to take a line on map of 6 inches

6 inches distance on map = 1.5 × 6 miles
= 9 miles

So, 6 inches on map shows 9 miles on ground.

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Q2. The R.F. is 1/100000 Construct a scale to show kilometer.

→ 1 cm distance on map = 100000 cm distance on ground

∴ 1 Km = 100000 cm

1 cm distance on map = $\frac{100000}{1,00,000}$ Km distance on ground

1 cm distance on map = 1 Km distance on ground.

we have to take a line on map of 15 cm.

15 cm distance on map = 1 x 15 Km

= 15 Km

So, 15 cm on map shows 15 Km on ground.

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Ans 2

R.F. = 1/100000

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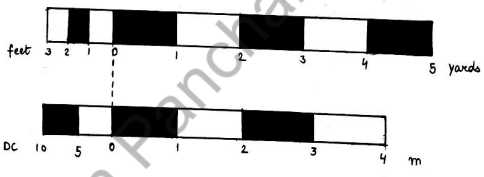
Ans:

R.F. = 1/36



Comparative Scale

Q.1. The R.F. is 1/36. Draw a comparative scale to show yards and metres.

⇒ 1 inch distance on map = 36 inches distance on ground.

∴ 1 yard = 36 inch

1 inch distance on map = $\frac{36}{36}$ yards on ground

1 inch distance on map = 1 yard on ground

we have to take a line on map of 6 inches

6 inches on map = 1 × 6 yard

= 6 yards

1 cm distance on map = 36 cm distance on ground

∴ 1 m = 100 cm

1 cm distance on map = $\frac{36}{100}$ = 0.36 m distance on ground

we have to take a line on map of 15 cm.

15 cm on map = 0.36 × 15 = 5.4 m on ground.

we have to take distance in round figure. So 5.4m is converted into 5 m.

5.4 m on ground shows 15 cm on map

So, 1 m = $\frac{15}{5.4}$ cm

5 m = $\frac{15}{5.4} \times 5 = \frac{750}{54}$ = 13.8 cm

5 m on ground shows 13.8 cm on map.

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Q.2 The R.F. is 1/31,680. Draw a comparative scale to show km and miles.

⇒ 1 inch distance on map = 31,680 inches distance on ground

∴ 1 mile = 63,360 inches

1 inch distance on map = $\frac{31\,680}{63,360}$ miles distance on ground

1 inch distance on map = 0.5 miles distance on ground

we have to take a line on map of 6 inches

6 inches on map = 0.5 × 6 = 3 miles on ground

1 cm distance on map = 31,680 cm distance on ground

∴ 1 km = 1,00,000 cm

1 cm distance on map = $\frac{31680}{100,000}$ km distance on ground

1 cm on map = 0.31 km on ground

we have to take a line on map of 15 cm

15 cm on map = 0.31 × 15

= 4.65 km on ground

we have to take distance in round figure. So. 4.65 is converted into 5 km

4.6 km on ground shows 15 cm on ~~ground~~ map

So, 1 km = $\frac{15}{4.6}$ cm.

5 km = $\frac{15}{4.6} \times 5 = 16.1$ cm

5 km on ground shows 16.1 cm on map

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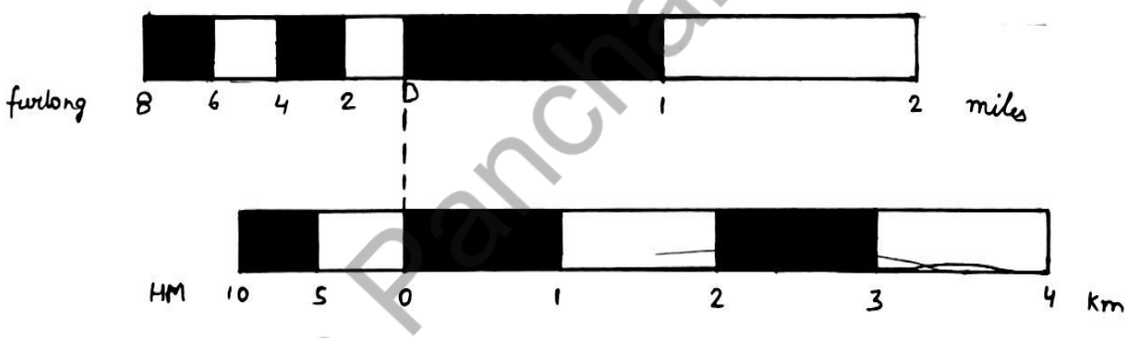
Ans 2.

R.F. = 1/31,680



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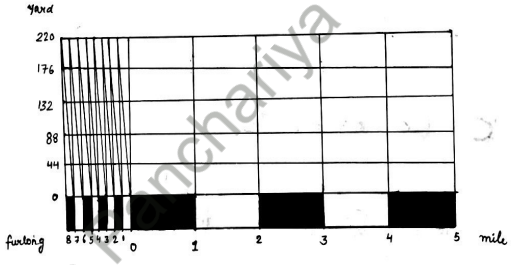
Ans 1

R.F. = 1/63,360



Diagonal Scale

Q.1 The R.F. is 1/63,360. Draw a diagonal scale to read mile, furlong, yard.

⇒ 1 inch distance on map = 63,360 inches distance on ground.

∴ 1 mile = 63,360 inches

1 ~~mi~~ inch distance on map = $\frac{63,360}{63,360}$ = 1 miles distance on ground

we have to take a line on map of 6 inches

6 inches on map = 1 × 6 miles on ground

= 6 miles

So, 6 inches on map shows 6 miles on ground

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Q2. The R.F. is 1/50. Draw a diagonal scale to read metres, decimetres and centimetres

⇒ 1 cm distance on map = 50 cm distance on ground.

∴ 1 m = 100 cm

1 cm distance on map = $\frac{50}{100}$ cm distance on ground

1 cm on map = 0.5 m on ground

We have to take a line on map of 14 cm

14 cm on map = 0.5 × 14 m on ground

14 cm on map = 7 m on ground

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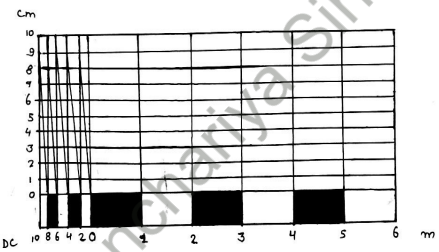
R.F. = 1/50

Ans 2.



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Mean

Q1. With the help of given table, find mean.

weight	No. of Students
10 - 20	5
20 - 30	15
30 - 40	17
40 - 50	21
50 - 60	27
60 - 70	5

⇒

weight	No. of students (f)	x	fx
10-20	5	15	75
20-30	15	25	375
30-40	17	35	595
40-50	21	45	945
50-60	27	55	1485
60-70	5	65	325
	Σf 90		Σfx 3800

$$\text{Mean } (\bar{x}) = \frac{\Sigma fx}{\Sigma f}$$

$$\bar{x} = \frac{3800}{90}$$

$$\bar{x} = 42.2 \text{ kg}$$

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Q: With the help of given table, find mean.

Irrigated area	Frequency
5-10	15
10-15	25
15-20	30
20-25	35
25-30	28
30-35	20
35-40	17

⇒

Irrigated area	Frequency	x	fx
5-10	15	7.5	112.5
10-15	25	12.5	312.5
15-20	30	17.5	525
20-25	35	22.5	787.5
25-30	28	27.5	770
30-35	20	32.5	650
35-40	17	37.5	637.5
	Ef 170		Efx 3795

Mean $(\bar{x}) = \frac{\Sigma fx}{\Sigma f}$

$\bar{x} = \frac{3795}{170}$

$\bar{x} = 22.32$

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Q2. With the help of given table of individual series, find mean.

Marks (x)	Students (f)
8	4
9	5
10	9
11	20
12	18
13	8
14	6

Marks (x)	Students (f)	fx
8	4	32
9	5	45
10	9	90
11	20	220
12	18	216
13	8	104
14	6	84
	Ef 70	Efx 791

$$\text{Mean } (\bar{x}) = \frac{\Sigma fx}{N}$$

$$\bar{x} = \frac{791}{70}$$

$$\bar{x} = 11.3$$

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Median

Q1: With the help of given table, find median.

Marks	No. of Students
28	3
30	7
32	12
34	28
36	10
38	8
40	6

⇒

Marks	No. of Students	Cf
28	3	3
30	7	10
32	12	22
34	28	50
36	10	60
38	8	68
40	6	74
	Ef 74	

$$\text{Median } (M) = \frac{N+1}{2}$$

$$M = \frac{74+1}{2}$$

$$M = \frac{75}{2} = 37.5^{th} \text{ term}$$

37.5 comes b/w 36 and 38

$$M = \frac{36+38}{2}$$

$$M = \frac{74}{2} = 37$$

37 comes under Cf 50. So Median is ~~38~~ 34

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Q2. Find median for the following data.

X	0-10	10-20	20-30	30-40	40-50
f	3	4	2	7	9

X	f	cf
0-10	3	3
10-20	4	7
20-30	2	9
30-40	7	16
40-50	9	25
	N=Ef = 25	

Median = $l_1 + \frac{i}{f}(m-c)$

Median = $\frac{N}{2} = \frac{25}{2} = 12.5^{th}$ term

12.5^{th} item lies in the group 30-40

By applying formula where

$l_1 = 30$, $i = 10$, $f = 7$, $m = 12.5$, $c = 9$

$\Rightarrow M = 30 + \frac{10}{7}(12.5-9)$

$\Rightarrow M = 30 + \frac{10}{7} \times 3.5$

$\Rightarrow M = 30 + 35$

$\Rightarrow M = 35.$

Median is 35.

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Q3. Find out the median from the following data.

120	200	170	800	620	350	375	640	750

⇒

Serial no.	Items arranged in ascending order
1	120
2	170
3	200
4	350
5	375
6	620
7	640
8	750
9	800
N = 9	

⇒ Median (M) = $\frac{N+1}{2}$

$M = \frac{9+1}{2} = \frac{10}{2} = 5$

Size of 5^{th} item = 375

Median = 375

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Mode

Q1 Find mode from the following table.

Marks	Students
10-20	9
20-30	13
30-40	21
40-50	20
50-60	15
60-70	8

⇒ $\text{mode} = l_1 + \frac{f_1 - f_0}{2f_1 - f_0 - f_2} \times i$

where $l_1 = 30$, $f_1 = 21$, $f_0 = 13$, $f_2 = 20$, $i = 10$

⇒ $z = 30 + \frac{21 - 13}{2 \times 21 - 13 - 20} \times 10$

$z = 30 + \frac{80}{9}$

$z = 38.89.$

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Q2 From the heights of 15 students, calculate the value of mode.

Height (in inches)	52	50	66	70	66	72	71	66	60	67	69	67	48	60	65

⇒ By arranging the series in an ascending order

48	50	52	60	60	65	66	66	66	67	67	69	70	71	72

By observation, height 66 inches occurs most, therefore, the mode (z) is 66 inches.

$z = 66$ inches.

Q3. Find out mode of the following series

Class-interval	0-5	5-10	10-15	15-20	20-25
frequency	2	4	15	6	7

⇒

class-interval	frequency
0-5	2
5-10	4
10-15	15
15-20	6
20-25	7

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⇒ Mode $= l_1 + \frac{f_1 - f_0}{2f_1 - f_0 - f_2} \times i$

where $l_1 = 10$, $f_1 = 15$, $f_0 = 4$, $f_2 = 6$, $i = 5$

$$Z = 10 + \frac{15-4}{2\times15-4-6} \times 5$$

$$Z = 10 + \frac{11}{20} \times 5$$

$$Z = 10 + 2.75$$

$$Z = 12.75$$

Mode $= 12.75$

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Standard deviation

Q.1. Calculate the standard deviation from the following data.

5	8	7	11	14

⇒

Values (x)	$x = x - \bar{x}$	x^2
5	$5-9 = -4$	16
8	$8-9 = -1$	1
7	$7-9 = -2$	4
11	$11-9 = 2$	4
14	$14-9 = 5$	25
Σx 45		Σx^2 50

Arithmetic mean $(\bar{x}) = \frac{\Sigma x}{N} = \frac{45}{5} = 9$

Standard deviation $(\sigma) = \sqrt{\frac{\Sigma x^2}{N}} = \sqrt{\frac{50}{5}} = \sqrt{10} = 3.16$

$\sigma = 3.16$

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Q. 2. Calculate standard deviation by actual mean method.

Size	5	10	15	20
Frequency	2	1	4	3

Size (x)	Frequency (f)	fx	$x = x - \bar{x}$	x^2	fx^2
5	2	10	-9	81	162
10	1	20	-4	16	16
15	4	60	+1	1	4
20	3	60	+6	36	108
	$N = \Sigma f = 10$	$\Sigma fx = 140$			$\Sigma fx^2 = 290$

Arithmetic mean $(\bar{x}) = \frac{\Sigma fx}{\Sigma f} = \frac{140}{10} = 14$

Standard deviation $(\sigma) = \sqrt{\frac{\Sigma fx^2}{N}} = \sqrt{\frac{290}{10}} = \sqrt{29} = 5.38$

Standard deviation is 5.38.

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Q.3. Calculate standard deviation by actual mean method.

Marks	0-10	10-20	20-30	30-40	40-50
No. of Students	4	3	6	5	2

Ans

Marks (x)	(f) No. of students	(m) Midpoint	fm	$x = m - \bar{x}$	x^2	fx^2
0-10	4	5	20	-19	361	1,444
10-20	3	15	45	-9	81	243
20-30	6	25	150	1	1	6
30-40	5	35	175	11	121	605
40-50	2	45	90	21	441	882
	$N = \Sigma f = 20$		$\Sigma fm = 480$			$\Sigma fx^2 = 3,180$

Arithmetic mean ($\bar{x}$) $= \frac{\Sigma fm}{\Sigma f} = \frac{480}{20} = 24$

Standard deviation (σ) $= \sqrt{\frac{\Sigma fx^2}{N}} = \sqrt{\frac{3180}{20}} = \sqrt{159} = 12.61$ marks

Standard deviation is 12.61 marks

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Chain - tape Survey

Chain -

The chain is made of strong iron or steel wire with a brass handle at each end. A complete chain has 100 links and each link consists of a long piece and a separate ring at each end.

There are two kinds of chains :

(i) Engineers chain, 100 feet long.

(ii) Gunter's chain, 66 feet long.

The Gunter's chain is convenient for land survey, viz. 80 chains equal 1 mile and 10 square chains equals 1 acre. i.e. $10 \times 66^2 = 43,500$ sq. ft. = 1 acre.

At intervals of 10 links there is a brass tag attached to the chain. A tag with one tooth indicates either 10 or 90 links, one with two teeth indicates 20 or 80, the one with three teeth indicates 30 or 70 links, that with four teeth 40 or 60 links and the central tag which has a circular shape indicates 50 links.

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Measuring Tape -

This is used for measuring distances and special care should be taken in measurement when only one base line is used. The tapes are generally 50 or 100 ft in length, but tapes varying in length from a 3 ft pocket tape to a 1000 ft steel tape are available.

Compass -

It is essentially an oblong box with parallel sides and glass lid cover, carrying a magnetic needle pivoted in the centre. The ends of the needle moves freely over graduated arcs. The magnetic needle can be fixed tight by a screw attached to the pivot or it can be loosened to move freely when taking observation. When the freely moving ends of the needle come to rest with both ends pointing at zero, the axis of the needle is parallel to the sides of the box and thus lines drawn along the edges would shown the magnetic direction.

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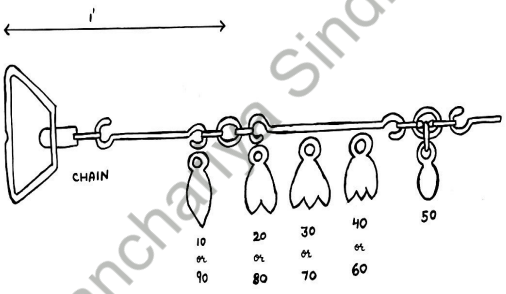
CHAINS



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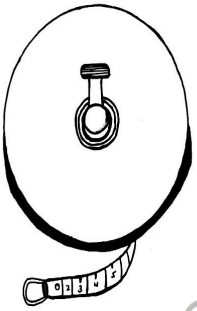
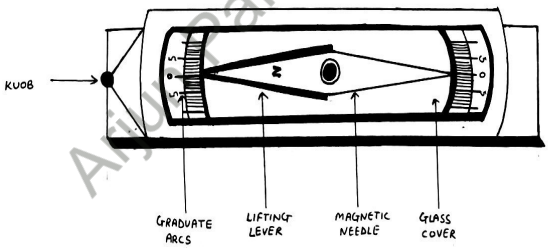
MEASURING TAPE



COMPASS



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Enlargement and reduction of Maps

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Square Method

Q.1 Enlarge an original map with a R.F. of 1/70,000,000 to a R.F of 1/35,000,000.

$$\Rightarrow x = \frac{\text{New Scale}}{\text{Old scale}} \times 1$$

$$\Rightarrow x = \frac{1/35,000,000}{1/70,000,000} \times 1$$

$$\Rightarrow x = \frac{1}{35,000,000} \times \frac{70,000,000}{1}$$

$$\Rightarrow x = \frac{70}{35}$$

$$\Rightarrow x = 2 \text{ cm}$$

This means new map will be twice of original map

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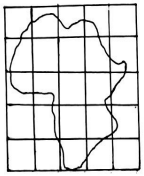
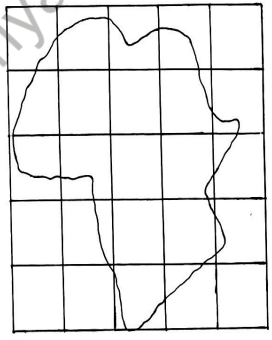
ORIGINAL MAP -



R.F. - 1:70,000,000

NEW MAP -



R.F. - 1:35,000,000

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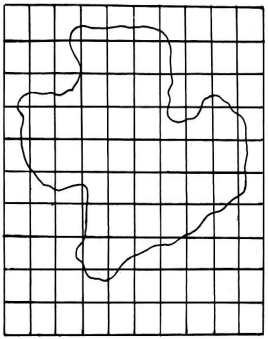
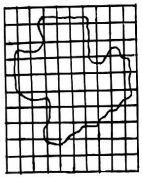
ORIGINAL MAP-



R.F. - 1:40,000,000

NEW MAP-



R.F. - 1:80,000,000

Q2. Reduce an original map with a R.F. of 1/40,000,000 to a R.F. of 1/80,000,000

$$\Rightarrow x = \frac{\text{New Scale}}{\text{Old Scale}} \times 1$$

$$\Rightarrow x = \frac{1/80,000,000}{1/40,000,000} \times 1$$

$$\Rightarrow x = \frac{1}{80,000,000} \times \frac{40,000,000}{1}$$

$$\Rightarrow x = \frac{4}{8}$$

$$\Rightarrow x = 1/2$$

This means, new map will be half of original map.

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Similar triangle Method

Q.1 Enlarge the map of a road whose R.F. is 1:20,000 to 1:10,000.

$\Rightarrow x = \frac{\text{New Scale}}{\text{old Scale}} \times 1$

$\Rightarrow x = \frac{1/10,000}{1/20,000} \times 1$

$\Rightarrow x = \frac{1}{10,000} \times \frac{20,000}{1}$

$\Rightarrow x = 2$

This means new map will be twice of original map.

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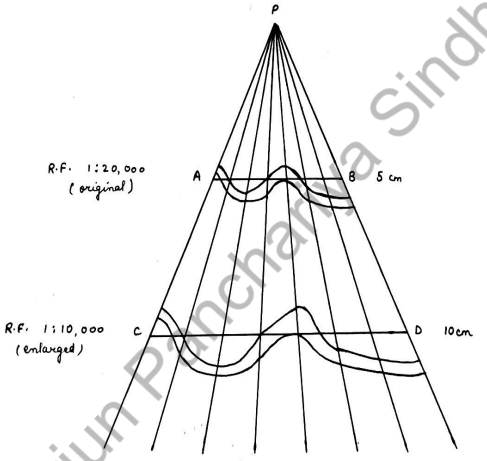

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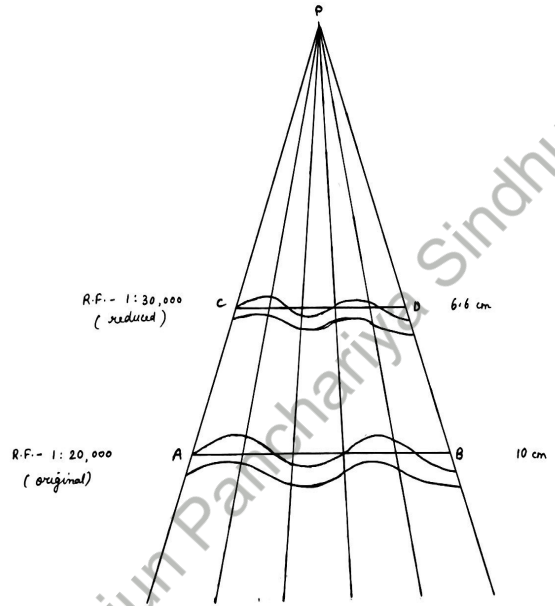

Q2 Reduce the map of a road of R.F. 1:20,000 to 1:30,000.

$$\Rightarrow x = \frac{\text{New Scale}}{\text{Old Scale}} \times 1$$

$$\Rightarrow x = \frac{1/30,000}{1/20,000} \times 1$$

$$\Rightarrow x = \frac{1}{30,000} \times \frac{20,000}{1}$$

$$\Rightarrow x = \frac{2}{3}$$

$$\Rightarrow x = 0.66.$$

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