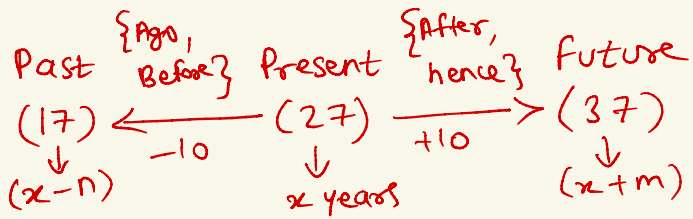
Aptitude Practice

Problems on Ages



① The present ages of A and B are in the ratio 4:5 and after 5 yr they will be in the ratio 5:6. The present age of A is,

$a:b = \frac{a}{b}$

→ ~~Past~~ Present (+5) Future

$4:5 \rightarrow 5:6$

$4x:5x$

$4x+5 : 5x+5 = 5:6$

$\frac{4x+5}{5x+5} = \frac{5}{6}$

$24x+30 = 25x+25$

$x = 5$

$4x5 = 20$

$5x5 = 25$

A = 20 yr
B = 25 yr

② The respective ratio of the present ages of Swati and Trupu is 4:5. Six years hence, the respective ratio of their ages will be 6:7. What is the difference betn their ages?

→ Past Present (hence +6) future

$4:5 \rightarrow 6:7$

$4x:5x$

$4x+6 : 5x+6 = 6:7$

$\frac{4x+6}{5x+6} = \frac{6}{7}$

$28x+42 = 30x+36$

$2x = 6$

$x = 3$

$4x3 = 12$

$5x3 = 15$

Swati = 12 yr
Trupu = 15 yr

Diff = 3 yrs

③ The ratio of present ages of two brothers is 1:2 and 5yr back, the ratio was 1:3. What will be the ratio of their ages after 5yr?

→ Past (back) −5 ← Present → +5 future

Past: 1:3 | Present: 1:2 | future: 15 : 25 ⇒ 3:5

$x : 2x$

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

$x = 10$

$2x10 = 20$

+5, +5

$3x - 15 = 2x - 5$

$x = 10$

④ The ratio of the present ages of Anju and Sandhya is 13:17, respectively. Four years ago, the respective ratio of their ages was 11:15. What will be the resp. ratio of their ages six years hence?

→ Past (Ago) −4 ← Present → +6 (hence) future

11:15 | 13:17 | 32 : 40 ⇒ 4:5

$13x : 17x$

$\frac{13x-4}{17x-4} = \frac{11}{15}$

$195x - 60 = 187x - 44$

$8x = 16$

$x = 2$

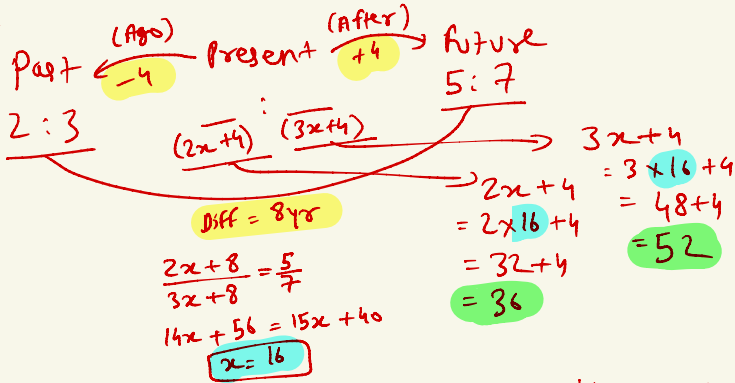
$13x2 = 26$ yr (Anju)

$17x2 = 34$ yr (Sandhya)

34+6, 26+6

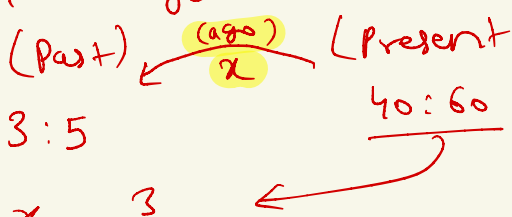
⑤ 4 yr ago, the ratio of the ages of A and B was 2:3 and after 4 yr, it will become 5:7. Find their present ages.

→



⑥ Harsha is 40 yr old and Rith is 60 yr old. How many years ago was the ratio of their ages 3:5?

→



$$\frac{40-x}{60-x} = \frac{3}{5}$$

$$200 - 5x = 180 - 3x$$

$$2x = 20$$

$x = 10$ yr ago

⑦ The ratio of the ages of two persons is 4:7 and age of one of them is greater than that of the other by 30 yr. The sum of their ages (in years) is,

→

A : B

4 : 7

4x : 7x → 7 × 10 = 70

4x × 10 = 40

4x ~ 7x = 30 yr

3x = 30

x = 10

∴ 40 + 70 = 110

⑧ The resp. ratio betⁿ the present ages of parag and sapna is 21:19. Six years ago, the resp. ratio betⁿ their ages was 9:8 How old is Lina, if her present age is 12 yr less than sapna's present age?

→

(Past) 9 : 8 ← −6 — (Present) Parag : Sapna

21 : 19

21x : 19x

$\frac{21x-6}{19x-6} = \frac{9}{8}$

$168x - 48 = 171x - 54$

$3x = 6$

$x = 2$

21x2 = 42

19x2 = 38

Sapna 38 yr − 12 yr = Lina 26 yr

Twice/Thrice the Age

Note: ① Father Age is three times the age of his Son.

Son	Father
= x	= 3x

② Father is aged three times more than his Son.

Son	Father
= x	= x + 3x
	= 4x

Que1 I am three times as old as my son. 15 yr hence I will be twice as old as my son. The sum of our ages is,

Father 3x ← 3x

3x 15 = 45

Son x → = 15

After 15 yr, x + 15

3x + 15 = 2(x + 15)

3x + 15 = 2x + 30

x = 15

∴ 45 + 15 = 60

② The sum of present ages of A and B is 11 times the difference of their ages. 5 years hence, their total ages will be 13 times the difference of their ages. What is the present age of elder one?

→ $(A+B) = 11(A-B)$

$A+B = 11A - 11B$

$11A - A = B + 11B$

$10A = 12B$

$\frac{A}{B} = \frac{6}{5} \Rightarrow A:B = 6:5$ (6x, 5x)

$6x+5 \quad 5x+5$

$6x+5+5x+5 = 13(6x-5x)$

$11x+10 = 13x$

$2x = 10$

$x = 5$

$A = 6x = 6 \times 5 = 30$

③ The present age of a father is 3yr more than three times the age of his son. 3yr hence, father's age will be 10yr more than twice the age of the son. The father's present age is,

→

	Son	father
Present Age	x	$3+3x$
Father Age	$x+3$	$3x+6$

$3x+6 = 10+2(x+3)$

$3x+6 = 10+2x+6$

$x = 10$

$3+3x \Rightarrow 3+3\times10 = 33$ (father)

④ 10 years ago daughter's age was two-fifth of her mother's age that time. While 10 years hence her age will be three fifth of her mother's age then. Find the difference in the ages of the two.

→ Daughter $= x$, Mother $= y$

$(x-10)$ $(y-10)$

$(x-10) = \frac{2}{5}(y-10)$ — ①

$(x+10) = \frac{3}{5}(y+10)$ — ②

$5x-50 = 2y-20$

$5x-2y = 30$ — ③

$5x+50 = 3y+30$

$5x-3y = 20$ — ④

③ − ④

$5x-2y = 30$

$-\ 5x-3y = 20$

$y = 50$

put $y = 50$ in eq^n ③

$5x - 2\times50 = 30$

$5x - 100 = 30$

$5x = 130$

$x = 26$

Mother $= y = 50$ yr

Daughter $= x = 26$ yr

$\therefore$ Diff $= M - D$

$= 50 - 26$

$= 24$ years

⑤ Father is aged three times more than his son Arun. After 8 years, he would be two and a half times of Arun's age. After further 8 years, how many times would he be of Arun's age?

→

	Son	father
Present age	x	$x + 3x = 4x$
+8 Future age	$x+8$	$4x+8$
+8		

$$4x+8 = 2\frac{1}{2}(x+8)$$

$$4x+8 = \frac{5}{2}(x+8)$$

$$8x+16 = 5x+40$$

$$3x = 40-16$$

$$3x = 24$$

$$\boxed{x = 8}$$

$\therefore$ Son = 8 yr, father = $4 \times 8 = 32$ yr

8 yr → (+8) 16 yr → (+8) 24

32 yr → (+8) 40 → (+8) 48

2 times

⑥ If the ages of A and C are added to twice the age of B, the total becomes 59. If the ages of B and C are added to thrice the age of A, the total becomes 68 and if the age of A is added to thrice the age of B and thrice and age of C, the total becomes 108. What is the age of A?

→ $A + C + 3B = 59$ —①

$B + C + 3A = 68$ —②

$A + 3B + 3C = 108$ —③

② × 3 ⇒ $3B + 3C + 9A = 204$

③ ⇒ $-\ 3B - 3C - A = -108$

$8A = 96$

$\boxed{A = 12}$

(7) Meena married 10 yrs ago. Today her age is $\frac{7}{5}$ times her age at the time of her marriage. Her daughter age $\frac{1}{5}$ of her age. What is the ratio of Meena's age to her daughter age after 5 years?

→ Meena = x

$(x-10)$

$x = \frac{7}{5}(x-10)$

$5x = 7x - 70$

$2x = 70$

Meena age $x = 35$ years

Daughter (D) $= \frac{1}{5} \times 35$

$= 7$ years

After 5 yr

$M = 35 + 5 = 40$ yrs

$D = 7 + 5 = 12$ yrs

$\therefore 40:12 \Rightarrow 10:3$

(8) The sum of the ages of father and son is 45 yrs. five yrs ago the product of their ages was 4 times the father's age at that time the present ages of father & son are?

→ (Son) x (father) y

Present $x + y = 45$

$x - 5 + y - 5 = 45$

Past $x + y = 35$

$x \times y = 4y$

$x = 4$

Put $x = 4$ in eqn Past

$x + y = 35$

$4 + y = 35$

$y = 31$ (Past age father)

$x = 4$ (Past age Son)

+5 → +5 → 9 yrs (Son)

+5 → 36 yrs (father)

(9) In a family, a couple has a son and daughter. The age of the father is four times that of his daughter and the age of the son is half of his mother. The wife is ten years younger to her husband and the brother is six years older than his sister. what is the age of the mother?

→

father	mother	Son	Daughter
$4x$	$4x-10$	$x+6$	x

$$x+6 = \frac{1}{2}(4x-10)$$

$$2x+12 = 4x-10$$

$$2x = 22$$

$$\boxed{x = 11}$$

mother $= 4x-10$

$= 4\times 11 - 10$

$= 44-10$

$\boxed{= 34 \text{ years}}$

(10) 6 yrs ago, three times the age of B was 2 more than the age if A that time. 6 yrs hence, twice age of B will be equal to A's age that time. find the total of their ages.

→

B	A
x yrs	y yrs
$(x-6)$	$(y-6)$

$$3(x-6) = 2+(y-6)$$

$$3x-18 = y-4$$

$$\boxed{3x-y = 14} \quad -(1)$$

$$2(x+6) = (y+6)$$

$$2x+12 = y+6$$

$$\boxed{2x-y = -6} \quad (2)$$

$3x - y = 14$

$-2x + y = +6$

$\boxed{x = 20}$

put $x = 20$ in eqn (1)

$3\times 20 - y = 14$

$-y = 14 - 60$

$-y = -46$

$\boxed{y = 46}$

A+B

$46 + 20$

$\boxed{= 66}$ yrs

(11) Sneha's mother's age is five yrs more than twice the age of Sneha. When Sneha was born, her brother Rahul was four years old and her father two years older than her mother. If the average age of her mother and father is 46 yrs. Find the ratio of age of Rahul to that of Sneha.

→

Father	Mother	Rahul	Sneha
$2x+7$	$5+2x$	$x+4$	x

(+2)

Rahul	Sneha
$20+4$	20
$24 : 20$	
$6 : 5$	

$$\frac{F+M}{2} = 46 \quad (46\times 2)$$

$$2x+7+5+2x = 92$$

$$4x+12 = 92$$

$$4x = 80$$

$$\boxed{x = 20}$$

Average on Ages

Note ① Average Age of father and mother is 34

$$\frac{F+M}{2} = 34 \Rightarrow \boxed{F+M = 68}$$

② Average Age of father, mother and son is 52

$$\frac{F+M+S}{3} = 52 \Rightarrow \boxed{F+M+S = 156}$$

(Q1) In a family, the average age of father and mother is 35 yr. The avg. age of the father, mother and their only son is 27 yr. What is the age of the son?

→

$$\frac{F+M}{2} = 35 \Rightarrow \boxed{F+M = 70}$$

$$\frac{F+M+S}{2} = 27 \Rightarrow F+M+S = 81$$

$$70+S = 81$$

$$\boxed{S = 11 \text{ years}}$$

② 5yr ago, the avg. age of A, B, C and D was 45yr. With E joining them now, the avg. age of all the five is 49 yr. How old is E?

→ Past ←(-5yr) Present

A, B, C, D

$\frac{A+B+C+D}{4} = 45$

$A+B+C+D = 180$ (Past)

A, B, C, D, E

$\frac{A+B+C+D+E}{5} = 49$

$A+B+C+D+E = 245$ — ① (Present)

$A+B+C+D = 200$ — ② (Present)

∴ to bring Past to present

$A+B+C+D = 180$

+5 +5 +5 +5

$A+B+C+D = 180+20$

$= 200$

∴ ① − ②

E = 45 year

③ The avg. age of a husband and wife, who were married 4yr ago, was 25yr at the time of their marriage. The avg. age of the family consisting of husband, wife and child, born during the interval is 20yr today. The age of the child is,

→ Past ←(-4yr) Present

$\frac{H+W}{2} = 25$

$H+W = 50$ (Past)

$H+W = 50$

+4 +4

$H+W = 58$

$\frac{H+W+C}{3} = 20$

$H+W+C = 60$ — ① (Present)

$H+W = 58$ — ② (Present)

$H+W+C = 60$

$58 + C = 60$

C = 2yr

④ Average age of 6 sons of a family is 8yr. Avg. age of Son together with their parents is 22 yr. If the father is older than the mother by 8yr, then the age of mother (in years) is,

→ mother father
x yr (x+8) yr

$\frac{6\text{ son}}{6} = 8\text{ yr}$

6 son (total Age) = 48 yr

$\frac{8\text{ person}}{8} = 22$

8 person {6 son + m + f} = 176 yr

48 + m + f = 176 yr

m + f = 128 yr

x + (x+8) = 128

2x = 120

x = 60

mother = 60 yr

father = 60 + 8 = 68 yr

⑤ When the avg. age of husband and wife and their son was 42 yr, the son got married and a child was born just one year after the marriage. When child turned to be 5yr, then the avg. age of family became 36 yr. What was the age of daughter-in-law at the time of marriage?

→ (m + f + s) → m + f + s + w → (child born) → m + f + s + w + c → 36 yr

(m + f + s): 42 yr; (m + f + s + w): 1 yr; 5 yr; 6 yr

$\frac{m+f+s}{3} = 42$

m + f + s = 126

$\frac{(m+6)+(f+6)+(s+6)+(w+6)+5}{5} = 36$ (5 = child)

m + f + s + w = (36 × 5) − 29

m + f + s + w = 180 − 29

126 + w = 180 − 29

w = 180 − 29 − 126

w = 25 year → daughter in law

Advanced

① The ratio of the age of a couple (man and his wife) is 5:3 when they get married. After 8 yrs their age's ratio becomes 7:5. When they purchase a new car their age's ratio is 3:2. Then after how much years they brought a new car?

→ M : W
5 : 3
$5x : 3x$

M : W
7 : 5

$5x \times 4 = 20$

$3x \times 4 = 12$

$$\frac{5x+8}{3x+8} = \frac{7}{5}$$

$25x + 40 = 21x + 56$

$4x = 16$

$\boxed{x = 4}$

$$\frac{20+x}{12+x} = \frac{3}{2}$$

$40 + 2x = 36 + 3x$

$\boxed{x = 4}$ years

② In a family the father's age is $\frac{1}{3}$ of the grandfathers age. The mothers age is $\frac{7}{9}$ of the fathers age and child age is $\frac{1}{7}$ of the mothers age. Find the difference bet grandfathers age and child's age, if the mothers age is 21.

→ Mom = 21, $C = \frac{1}{7} \times 21 =$ $\boxed{\text{Child} = 3 \text{ yr}}$

$21 = \frac{7}{9} \times F$

$F = 27 \times \frac{9}{7}$

$\boxed{F = 27}$

$27 = \frac{1}{3} \times G.F$

$GF = 3 \times 27$

$\boxed{= 81}$

G.f. = 81
Child = 3
78

③ Preethi fathers age was 2.5 times of Preethi's age, the ratio of the present age of preethi's mother to Preethi's grandmother age is 5:9. 3yrs hence Preethi's mother age was 43 and ratio of age of her grand-father, grandmother and preethi is 13:12:3. what is Preethi's father age after 7 years?

→ P.F = 2.5 × P

P.M. : P.G.M = 5:9

5x : 9x

↓ (8)

40 : 72

P.G.F : P.G.M : P = 13 : 12 : 3

= 13x : 12x : 3x

↓

12x = 72

x = 6

Preethi Age = 18

P.F. = 2.5 × 18

P.F = 45 + 7

∴ PF = 52 year

④ The present age of Romila is one fourth of that of her father After 6yrs the father's age will be twice the age of kapil. If kapil celebrated fifth birth day 8 yrs ago, what is Romila's present age?

→ Present +6 →

R = 1/4 × F

F = 2k

5+8 k = 13 +6 →

F = 2(19)

= 38 yr

R = 1/4 × 38

R = 8 yr

(5) X is age 3 yrs ago was three times the present age of Y. At present. Z's age is twice the age of Y. Also Z is 12 years younger than X. What is the present age of Z?

→ Y's age = 'a'

'X' present age = (3a + 3)

$Z = 2a$

$x \sim z = 12$

$3a + 3 - 2a = 12$

$a = 9$

$Z = 2 \times 9$

$Z = 18$

(6) The resp. ratio betn the present age of Ram and Selva is 3 : X. Selva is 24 yrs old than prem. Prem's age after 7 years will 23 yrs. Ram's age is 75% of Selva's age. What is the difference betn the value of X and the age of Ram.

→ Ram : Selva

3 : x

3y : 4y

4 ~ 30

Ram age = 26

Selva = 24 + Prem (16) +7 (23)

Selva = 40

Prem = 16

$Ram = \frac{75}{100} \times 40$

Ram = 30

(7) 4 years ago, the respective ratio between $\frac{1}{2}$ of A's age at that time and four times of B's age at that time was 5:12. Eight years hence $\frac{1}{2}$ of A's age at that time will be less than B's age at that time by 2 years. What is B's present age?

→

Past	Pre	Future
5 : 12	$10x+4$: $3x+4$	$A = 10x+12$, $B = 3x+12$
$\frac{1}{2} \times A = 5$, $A = 10x$	$3(2)+4$	$\frac{10x+12}{2} = (3x+12)-2$
$4B = 12$, $B = 3x$	$= 6+4$	$10x+12 = 3x+10$
	$= 10$	$10x+12 = 6x+20$
		$4x = 8$
		$x = 2$

(8) 8 years ago, Jyoti's age was equal to Swati's present age. If the sum of Jyoti's age 10 yrs from now and Swati's age 6 yrs ago is 88 yrs. What was Jusum's age 14 yrs if Jusum is 8 yrs younger to Swati? (in yrs)

→

	Past	Present
Swathi	$x-6$	x
Jothi		$x+8$

$x+8+10+x-6 = 88$

$2x+12 = 88$

$2x = 88-12$

$2x = 76$

Swathi $x = 38$

Swathi
38
− 8 younger to Swati
30 ← Jusum
− 14 ago
16 ← Jusum age

(9) Three yrs ago, the resp. ratio betn A's age at that time and B's age at that time was 9:5. If A's age two yrs hence will be 17 yrs more than B's age five years hence, what is B's present age?

→ Past ⟵ (−3) Present

9 : 5 ⟶ $9x+3$ + 2

$5x+3$ + 5

A ~ B = 17

$9x+3+2-5x-3-5=17$

$4x = 20$

$x = 5$

$5x+3$

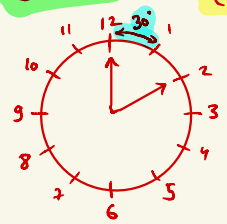
$= 5\times 5+3$

= 28 B's present age

Clock

(H·H) → Hour hand → small
(m·H) → minute hand → large

Total angle = 360°



① gap = $\frac{360^\circ}{12} = 30^\circ$

② 1 hr ⇒ 60 min = 30°
(m·H) (H·H)

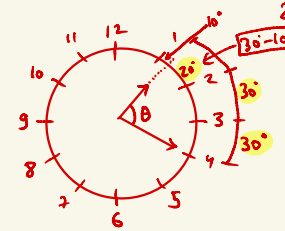
1 min = $\frac{1}{2}^\circ$
(m·H) (H·H)

eg. 20 min = 10°
(m·H) (H·H)

45 min = 22.5°
(m·H) (H·H)

① What is the angle betn min hand and hour hand at 1:20?

→



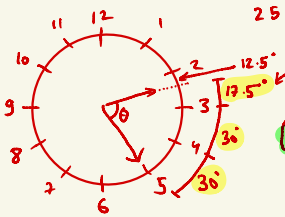
20 min = 10° ← $\frac{20}{2}$

30° − 10°

30° + 30° + 20°
= 80°

② What is the angle betn min hand and hour hand at 2:25?

→



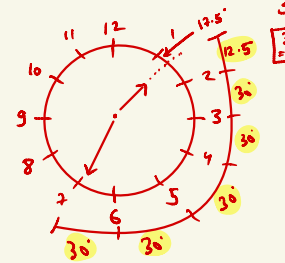
25 min = 12.5° ← $\frac{25}{2}$

30° − 12.5°

30° + 30° + 17.5°
= 77.5°

③ What is the angle betn minute hand and hour hand at 1:35?

→



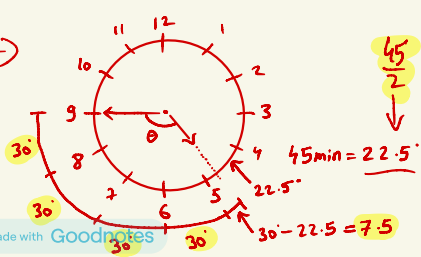
35 min = 17.5° ← $\frac{35}{2}$

30 − 17.5
= 12.5

150° + 12.5°
= 162.5°

④ What is the angle betn min hand and hour hand at 4:45?

→



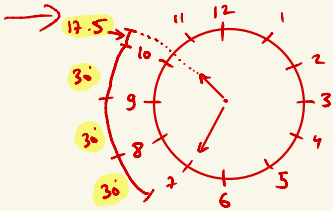
$\frac{45}{2}$

45 min = 22.5°

30 − 22.5 = 7.5

120° + 7.5° = 127.5°

⑤ What is the angle betn minute hand and hour hand at 10:35?

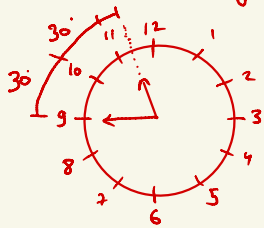


35 min = 17.5° ← 35/2

90° + 17.5°

= 107.5°

⑥ What is the angle betn min hand and hour hand at 11:45?



45 min = 22.5° ← 45/2

60° + 22.5°

= 82.5°

formula method

$$= \left|30H - \frac{11}{2}(m)\right|$$

① 1:20?

$= |30H - \frac{11}{2}(m)|$

$= |30(1) - \frac{11}{2}(20)|$

$= |30 - 110|$

$= |-80| \Rightarrow 80°$

② 2:25?

$= |30H - \frac{11}{2}(m)|$

$= |30(2) - \frac{11}{2}(25)|$

$= |60 - \frac{275}{2}|$

$= |60 - 137.5|$

$= |-77.5|$

$\Rightarrow 77.5$

③ 11:45?

$= |30H - \frac{11}{2}(m)|$

$= |30(11) - \frac{11}{2}(45)|$

$= |330 - \frac{495}{2}|$

$= |330 - 247.5|$

$= 82.5°$

Note: more than 180° ⇒ Reflex angle

④ 12:30?

$= |30H - \frac{11}{2}(m)|$

$= |30 \times 12 - \frac{11}{2}(30)|$

$= |360 - 165|$

$= 195°$ ← Reflex angle ⇒

$\therefore 360° - 195°$

$= 165°$

⑤ 10:10?

$= |30H - \frac{11}{2}(m)|$

$= |30 \times 10 - \frac{11}{2}(10)|$

$= |300 - 55|$

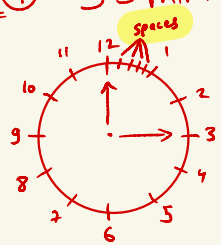
$= 245°$

$\therefore 360° - 245°$

$= 115°$

Hands Together

Note ① "55 min spaces are gained by minute hand in 60 minutes"



3:00 to 4:00

60 spaces (M.H) 5 spaces (H.H) ⇒ 60 ~ 5

in 1 hr

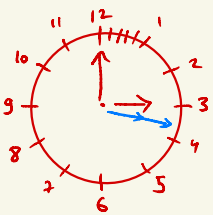
= 55 spaces

M.H → minute hand

H.H → hour hand

Q1 At what time betn 3 o'clock and 4 o'clock, will the hands of a clock be together?

→



55 spaces = 60 min

15 min = x

55 × x = 60 × 15

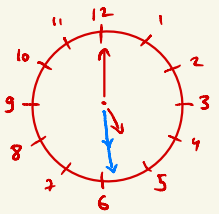
$x = \frac{60 \times 15}{55} = \frac{3}{11}$

$x = \frac{180}{11} \Rightarrow 16\frac{4}{11}$ past 3

$11\overline{)180}\ (16,\ 11,\ 70,\ 66,\ 4$

② At what time betn 5 o'clock and 6 o'clock, will the hands of a clock be together?

→



55 spaces = 60 min

25 min = x

55 × x = 60 × 25

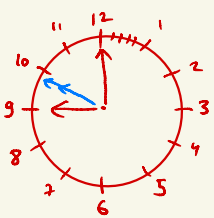
$x = \frac{60 \times 25}{55} = \frac{5}{11}$

$x = \frac{300}{11} \Rightarrow 27\frac{3}{11}$ past 5

③ At what time betn 9 o'clock and 10 o'clock, will the hands of a clock be together?

(1 hr)

→



55 min spaces = 60 min

45 min spaces = x

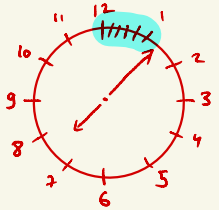
$x = \frac{60 \times 45}{55} = \frac{9}{11}$

$x = \frac{540}{11} \Rightarrow 49\frac{1}{11}$ past 9

Hands of the clock opposite

"55 min spaces are gained by minute hand in 60 min"

① At what time betⁿ 7 o'clock and 8 o'clock the hands of the clock be in opposite direction?

→ 

$55 = 60$

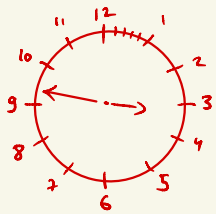
$5 = x$

$x = \frac{60 \times 5}{55\ 11}$

$= \frac{60}{11} \Rightarrow 5\frac{5}{11}$ past 7

$11\overline{)60}\ 5$, 55, 5

② At what time betⁿ 3 o'clock and 4 o'clock the hands of the clock be in opposite direction?

→ 

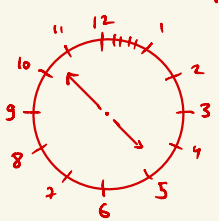
$55 = 60$

$45 = x$

$x = \frac{60 \times 45^{9}}{55\ 11}$

$= \frac{540}{11} \Rightarrow 49\frac{1}{11}$ past 3

③ At what time betⁿ 4 o'clock and 5 o'clock the hands of the clock be in opposite direction?

→ 

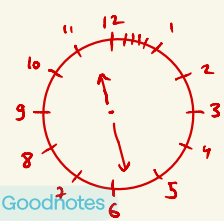
$55 = 60$

$50 = x$

$x = \frac{60 \times 50^{10}}{55\ 11}$

$= \frac{600}{11} \Rightarrow 54\frac{6}{11}$ past 4

④ At what time betⁿ 11 o'clock and 12 o'clock the hands of the clock be in opposite direction?

→ 

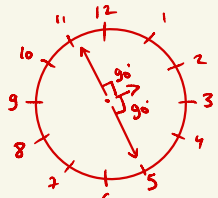
$55 = 60$

$25 = x$

$x = \frac{60 \times 25^{5}}{55\ 11}$

$= \frac{300}{11} \Rightarrow 27\frac{3}{11}$ past 11

Right Angle

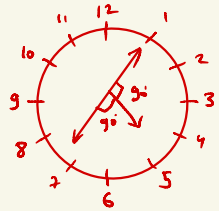


Note: we get two ans check and mark which is in option

Steps ① Draw his hand
② Draw perpendicular line
③ Find answer ②

① At what time betn 4 o'clock and 5 o'clock, will the both hands of a clock be at right angle?

→

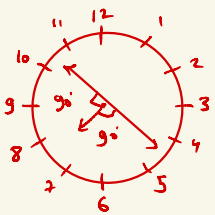


①
$55 = 60$
$5 = x$
$x = \frac{60 \times 5}{55_{11}}$
$= \frac{60}{11}$
$\Rightarrow 5\frac{5}{11}$ past 4

②
$55 = 60$
$35 = x$
$x = \frac{60 \times 35^{7}}{55_{11}}$
$= \frac{420}{11}$
$= 38\frac{2}{11}$ past 4

② At what time betn 7 o'clock and 8 o'clock, will the both hands of a clock be at right angle?

→

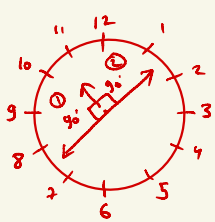


①
$55 = 60$
$20 = x$
$x = \frac{60 \times 20^{4}}{55_{11}}$
$= \frac{240}{11}$
$= 21\frac{9}{11}$ past 7

②
$55 = 60$
$50 = x$
$x = \frac{60 \times 50^{10}}{55_{11}}$
$= \frac{600}{11}$
$= 54\frac{6}{11}$ past 7

③ At what time betn 10 o'clock and 11 o'clock will the both hands of a clock be at right angle?

→



①
$55 = 60$
$35 = x$
$x = \frac{60 \times 35^{7}}{55_{11}}$
$= \frac{420}{11}$
$= 38\frac{2}{11}$ past 10

②
$55 = 60$
$5 = x$
$x = \frac{60 \times 5}{55_{11}}$
$= \frac{60}{11}$
$= 5\frac{5}{11}$ past 10

Apart

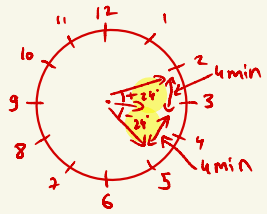
60 min → 360°

1 min → 6°

$\theta = 30H - \frac{11}{2}m$

① At what time betn 3 o'clock and 4 o'clock will both the hands of a clock be 4 min apart?

→ (3-4) 4 min apart ?



① 1 min = 6°

∴ 1 min = 6° × 4° = 24°

② $\theta = 30H - \frac{11}{2}m$

$+24 = 30(3) - \frac{11}{2}m$ ⓑ $-24 = 30(3) - \frac{11}{2}m$

$\frac{11}{2}m = 90 - 24$ $\frac{11}{2}m = 114$

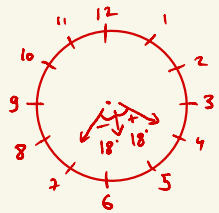
$\frac{11}{2}m = 66$ $m = \frac{228}{11} = 30\frac{8}{11}$ past 3

$m = \frac{132}{11}$

m = 12 min

② At what time betn 5 o'clock and 6 o'clock will both the hands of a clock be 3 min apart?

→



(5-6) 3 min Apart

$6° \times 3 = 18°$

$+18$

$18 = 30(5) - \frac{11}{2}m$

$\frac{11}{2}m = 150 - 18$

$= \frac{132}{11} \times 2$

$m = 24$ min past 5

-18

$-18 = 30(5) - \frac{11}{2}m$

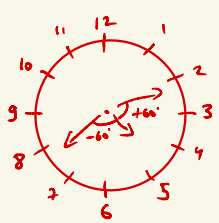
$\frac{11}{2}m = 150 + 18$

$m = \frac{168 \times 2}{11}$

$m = \frac{336}{11} = 30\frac{6}{11}$ past 5

③ At what time betn 4 o'clock and 5 o'clock will both the hands of a clock be 10 min apart?

→ (4-5) 10 min apart.



1 min → 6° × 10 = 60°

$+60$

$60 = 30(4) - \frac{11}{2}m$

$\frac{11}{2}m = 120 - 60$

$m = \frac{120}{11}$

$m = 10\frac{10}{11}$ past 4

-60

$-60 = 30(4) - \frac{11}{2}m$

$\frac{11}{2}m = 120 + 60$

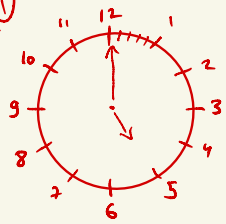
$m = \frac{360}{11}$

$m = 32\frac{8}{11}$ past 4

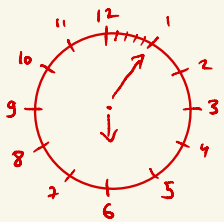
loss & gain

* clock gaining 5 min every hour.

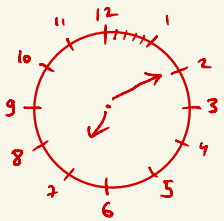
Note ①



5:00

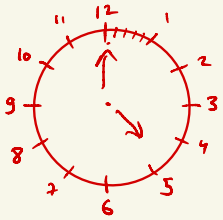


right time = 6:00
5 min gain = 6:05

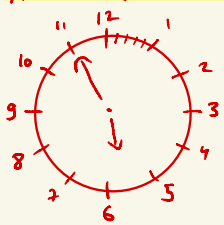


right time = 7:00
5 min gain = 7:10

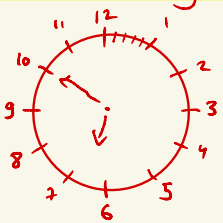
* clock loss 5 min every hour.



5:00



right time = 6:00
5 min loss = 5:55



right time = 7:00
5 min loss = 6:50

Note ②

$45\frac{4}{5}$ hours

1 hr = 60 min

$\Rightarrow 45$ hours $\frac{4}{5} \times 60^{12}$

45 hour 48 minutes

$23\frac{1}{3}$ hrs

1 hr = 60 min

$\Rightarrow 23\frac{1}{3} \times 60^{20}$

23 hrs 20 min

Q1 Akash saw the clock when it was set right at 8 am. The clock gaining 5 min in an hour. what time will it shows at 8 pm at the same day?

→ 8 am – 8 pm (12 hrs)

1 hr → 5 min

12 hr → 12 × 5 ⇒ 60 min

original: 8 pm

wrong: 9 pm

Q2 If a clock gains 5 min every hour and it set correctly at 5 am, then at what time will it shows at 10 am at the same day?

→ 5 am — 10 am (5 hrs)

1 hr → 5 min

5 hr → 5 × 5 = 25 min

original: 10:00 am

wrong: 10:25 am

Q3) Raju observed that a watch loses 5 sec in one hr which was set right at 7 am. What time will it show at 2pm on the same day?

→ 7am ⟶ 2pm (7hr)

1hr → 5sec (loss)

7hr → 7×5 ⇒ 35sec (loss)

original wrong

2:00 pm 1:59:25

hr min sec

Q4) A clock is set correctly at 1pm. If it loses 3 min every hour, what time will the clock show when the correct time is 10 am the next day?

→ 1pm ⟶ 10am

1pm − 1am, +9 hrs

12 hrs + 9 hrs = 21 hrs

1 hrs = 3 min (loss)

21 hrs = 21×3 = 63 min

original wrong

10:00 am 8:57 am

Q5) A watch losses 5 sec every hr. The watch was set correctly on wednesday at 6:30am. what time did it show at 6:30 am in the next wednesday?

→ 6:30 am ⟷ 6:30 am (Next wed (7 days))

1 hr → 5sec

24 hr → 24×5 = 120 sec

= 2 min (1 day loss)

In 7 days,

2 min × 7 = 14 min (loss)

original wrong

6:30am 6:16 am

Q6) A watch gains 5 sec in 3 min was set right at 6:00 am what time will it shows at 8:00 pm on the same day?

→ 6:00 am ⟷ 8:00 pm (6:00 am to 6:00 pm, +2 hrs

12 hrs

= 4 hrs

5sec → 3min

×20 ×20

100 sec → 1 hr

Convert to 1 hr

23
6)140
12
20
18
2

14 hrs → 1400 sec

$23\frac{2}{6}$ min

23 min $\frac{2}{6}$ × 60

23 min 2sec

total gain

original wrong

8:00pm 8:23:20

hr min sec

CALENDAR

$\frac{2019}{4}$ → ordinary year : (365 days)

* last two digit Not divisible by (4)
* feb 28 days
* 52 week + 1 odd day

$\frac{2020}{4}$ → Leap year : (366 days)

* last two digit divisible by (4)
* feb 29 days
* 52 weeks + 2 odd days
* If century year divide by 400 (eg) 400, 1600, 2000

odd days

0 - Sunday
1 - mon
2 - Tue
3 - wed
4 - Thur
5 - Fri
6 - Sat

(eg): 10 days → 1 week + 3 odd days
(7 days)

16 days → 2 week + 2 odd days

21 days → 3 week + 0 odd day

(eg) 0001 - 0020

$\frac{20}{4} = 5$ (multiple of 4)

↳ 5 (Leap year) + 15 (ordinary year)

5 × 2 (odd day) 15 × 1 (odd day)

5 × 2 + 15 × 1
= 10 + 15 = 25 odd days
↳ divide by (7)
3 week + 4 odd day

∴ 31st Dec 0020
Thursday

for century

0 - 100
↳ (0-99) + (100)
24 (leap year) + 100 (ordinary year)
⇒ 24 (L.Y) + 76 (O.Y)
⇒ 24 × 2 odd day + 76 × 1 odd day
⇒ 48 + 76
⇒ 124 odd day
↳ ÷7
⇒ 17 week + 5 odd day
Friday
↳ 31st Dec 0100 ⇒ Friday

$\frac{100}{400}$ ⇒ ∴ 100 (O.Y)

Note: first 100 years → 5 odd days

200 years → 5 × 2 ⇒ 10 odd days

⇒ 1 week + 3 odd days → wednesday

300 years → 5 × 3 ⇒ 15 odd days

⇒ 2 week + 1 odd day → monday

400 years → (5 × 4 + 1) ⇒ 21 odd days

bcz $\frac{400}{4}$

∴ we add 1 yr extra

⇒ 3 week + 0 odd day → sunday

⇒ 31st Dec 400 → Sunday

600 year → 400 yr + 200 yr

↓

0 (odd day) + 3 (odd day)

⇒ 3 odd day → wed

700 year → 400 yr + 300 yr

↓

0 (odd day) + 1 (odd day)

⇒ 1 odd day → monday

Important note

① $\div 4$ ⇒ To find Leap year / ordinary year

② $\div 400$ ⇒ century year

③ $\div 7$ ⇒ week + ___ odd days

④ 0 – 6 (odd days)

↓

Sunday

Day of the week (Non Leap year)

Jan – 31 – 3 (odd day)
Feb – 28 – 0
Mar – 31 – 3
Apr – 30 – 2
May – 31 – 3
June – 30 – 2
July – 31 – 3
Aug – 31 – 3
Sep – 30 – 2
Oct – 31 – 3
Nov – 30 – 2
Dec – 31 – 3

first 100 yr – 5 odd day
first 200 yr – 3 odd day
first 300 yr – 1 odd day
first 400 yr – 0 odd day

Odd day chart →

0	1	2	3	4	5	6
↓	↓	↓	↓	↓	↓	↓
Sun	Mon	Tue	Wed	Thur	Fri	Sat

31 days → 3 odd day
30 days → 2 odd day
28 days → 0 odd day
29 days → 1 odd day

① Which day of the week was 12 feb 1941?

→ 12 feb 1941 ↳ ÷4 ∴ (ordinary year)

1600 + 300 + 40 + Jan + 12 feb
0 (odd day) + 1 (odd day) + ÷4 + 3 (odd day) + 12 days

(10 leap year + 30 ordinary year)

40/4 ⇒ 10 leap year

(leap year – 2 odd day)
(ordinary year – 1 odd day)

0 + 1 + (10 × 2 (odd day) + 30 × 1 (odd day)) + 3 + 12
1 + 50 + 3 + 12
50 + 16
= 66 odd days
÷7 ↳ 9 week + 3 odd days
↳ wednesday

(2) Which day of the week was 18 April 1963?

÷4 → α (ordinary year)

→ $\frac{62}{4} = 15$

(leap year – 2 odd day)
(ordinary year – 1 odd day)

18 Apr 1963

1600 + 300 + 62 yr + (Jan – Mar) + 18 days

odd day 0 + 1 + ÷4 + (3 + 0 + 3) + 18

(15 × L.Y. (2) + 47 × 0.Y. (1))

0 + 1 (30 + 47) + 6 + 18

77 + 6 + 18 + 1

102 → ÷7 → 14 week + 4 odd day → Thur

(3) Which day of the week was 21 July 1630?

÷4 → α (ordinary years)

→ 21 July 1630

$\frac{29}{4} = 7$

1600 + 29 yr + (Jan – June) + 21 days

odd days 0 + (7 × L.Y. (2) + 22 × 0.Y. (1)) + (3 + 0 + 3 + 2 + 3 + 2) + 21 day

0 + (14 + 22) + 16 + 21

= 73 odd days → ÷7 → 10 week + 3 odd days → Wed

(4) Which day of the week was 2 may 1921?

÷4 → α (ordinary years)

→ 2 may 1921

$\frac{20}{4} = 5$

1600 + 300 + 20 yr + (Jan – Apr) + 2 days

odd days 0 + 1 + (5 × L.Y + 15 × 0.Y) + (3 + 0 + 3 + 2) + 2

1 + 10 + 15 + 10

= 36 odd day → ÷7 → 5 week + 1 Odd day → mon

⑤ which day of the week was 2 Dec 1818

→ 2 Dec 1818 — $\frac{17}{4} = 4$ L.Y. — $\div 4 \hookrightarrow 1$ (ordinary years)

$1600 + 200 + 17\text{yr} + (6\times3 + 4\times2) + 2$

odd days

$0 + 3 + (4 \times 4 \text{ L.Y.} + 13 \times 1 \text{ O.Y.}) + 28$

(2) (1)

$0 + 3 + (8 + 13) + 28$

52 odd day

$\div 7 \hookrightarrow$ 7 week + 3 odd days → Wed

Day of the Week (Leap Year)

① what day of the week was 12 march 1940?

$\div 4 \hookrightarrow$ ✓ (leap year)

12 Mar 1940 — $\frac{39}{4} = 9$ Leap year

$1600 + 300 + 39 + (\text{Jan-Feb}) + 12$

odd days

$0 + 1 + (9 \times 1 \text{ L.Y} + 39 \times 0 \text{ O.Y}) + (3+1) + 12$

(2) (1)

$1 + (18 + 30) + 3 + 1 + 12$

65 odd days

$\div 7 \hookrightarrow$ 9 week + 2 odd days → Tue

first 100 yr — 5 odd day
first 200 yr — 3 odd day
first 300 yr — 1 odd day
first 400 yr — 0 odd day

odd day chart → 0 Sun, 1 Mon, 2 Tue, 3 Wed, 4 Thur, 5 Fri, 6 Sat

31 days → 3 odd day
30 days → 2 odd day
28 days → 0 odd day
29 days → 1 odd day

(leap year — 2 odd day)
(ordinary year — 1 odd day)

② what day of the week was 18 April 1964?

→ 18 Apr 1964 — $\frac{67}{4} = 15$ Leap year — $\div 4 \hookrightarrow$ ✓ (leap year)

$1600 + 300 + 63\text{yr} + (\text{Jan-mar}) + 18$

odd days

$0 + 1 + (15 \times 1 \text{ L.Y} + 48 \times 0 \text{ O.Y}) + (3+1+3) + 18$

(2) (1)

$1 + (30 + 48) + 7 + 18$

= 104 odd days

$\div 7 \hookrightarrow$ 14 week + 6 days → Sat

③ What day of the week was 21 July 1632?

→ 21 July 1632 — $\frac{31}{4}$ = 7 Leap year — ÷4 → ✓ (Leap year)

1600 + 31 yrs + (Jan - June) + 21

odd days = 0 + [7 × L.Y. (2) + 24 × O.Y. (1)] + [3 + 1 + 3 + 2 + 3 + 2] + 21

14 + 24 + 12 + 5 + 21

76

÷7 → 10 week + 6 odd day → Sat

⑥ What day of the week was 2 May 1920?

→ 2 May 1920 — $\frac{19}{4}$ = 4 Leap year — ÷4 → Leap year

1600 + 300 + 19 yrs + [Jan - Apr] + 2 May

0 + 1 + [4 × L.Y (2) + 15 × O.Y (1)] + [3 + 1 + 3 + 2] + 2

1 + 8 + 15 + 9 + 2

35

÷7 → 5 week 0 Odd days → Sun

⑤ What day of the week was 2 Dec 1816?

→ 2 Dec 1816 — $\frac{15}{4}$ = 3 Leap year — ÷4 → Leap year

1600 + 200 + 15 yrs + [Jan - Nov] + 2 Dec

0 + 3 + [3 × L.Y. (2) + 12 × O.Y (1)] + [6 × 3 + 4 × 2 + 1] + 2

3 + 6 + 12 + 18 + 8 + 1 + 2

50

÷7 → 7 week + 1 odd day → Mon

On what Dates

① on what dates of April 2001 did Wednesday fall?

→ 1 Apr 2001

÷4 ↳ ∝ ordinary year

1600 + 400 + (Jan – march) + 1

0 + 0 + (3 + 0 + 3) + 1

= 7

÷7 ↳ 1 week + 0 odd day ↳ Sun

1 Apr 2001 → Sun

4 Apr 2001 → wed

↳ 11 ↳ 18 ↳ 25 } wed

Ans 4, 11, 18, 25

② on what dates of may 1945 did Saturday fall?

→ 1 may 1945

$\frac{44}{4} = 11$ (L.Y.) → ÷4 ↳ ∝ ordinary year

1600 + 300 + 44yr + (Jan – Apr) + 1

0 + 1 + [11 × L.Y. (2) + 33 × 0.Y (1)] + [3 + 0 + 3 + 2] + 1

1 + [22 + 33] + [9]

10 + 55

65

÷7 ↳ 9 week + 2 odd day ↳ Tue

1 may 1945 → Tue

⋮

5 may 1945 – Sat

↳ 12 ↳ 19 ↳ 26 } Sat

Ans 5, 12, 19, 26

③ on what dates of Feb 1842 did Thursday fall?

→ 1 Feb 1842

÷4 ↳ ∝ (ordinary year)

$\frac{41}{4} = 10$ (L.Y.) →

1600 + 200 + 41yr + (Jan) + 1

0 + 3 + [10 × L.Y. (2) + 31 × 0.Y (1)] + 3 + 1

3 + 20 + 31 + 4

58 days

÷7 ↳ 8 week 2 odd days ↳ Tue

1 feb 1842 → Tue

⋮

3 feb 1842 → Thur

+7 ↳ 10

+7 ↳ 17

+7 ↳ 24

Ans 3, 10, 17, 24

④ on what dates of June 1764 did Monday fall?

→ 1 June 1764

÷4 ↳ ✓ (Leap year)

$\frac{63}{4}$ = 15 Leap year

1600 + 100 + 6340 + (Jan - may) + 1 June

0 + 5 + [15 × Leap year + 48 × 0.4.] + [3+1+3+2+3] + 1

5 + 30 + 48 + 12 + 1

78 + 18

96 days

÷7 ↳ 13 week + 5 odd day

↳ Fri

1 June 1764 → Friday

⋮

4 June 1764 → Mon

+7 ↳ 11

+7 ↳ 18

+7 ↳ 25

Ans 4, 11, 18, 25