Real Numbers Ex 1.2 Q3

Answer :

(i) We need to find the H.C.F. of 963 and 657 and express it as a linear combination of 963 and 657.

By applying Euclid's division lemma $963 = 657 \times 1 + 306$.

Since remainder $\neq 0$, apply division lemma on divisor 657 and remainder 306

$657 = 306 \times 2 + 45$.

Since remainder $\neq 0$, apply division lemma on divisor 306 and remainder 45

$306 = 45 \times 6 + 36$.

Since remainder $\neq 0$, apply division lemma on divisor 45 and remainder 36

$45 = 36 \times 1 + 9$.

Since remainder $\neq 0$, apply division lemma on divisor 36 and remainder 9

$36 = 9 \times 4 + 0$.

Therefore, H.C.F. = 9.

Now,

$$
\begin{aligned}
9 &= 45 - 36 \times 1 \\
&= 45 - [306 - 45 \times 6] \times 1 \\
&= 45 - 306 \times 1 + 45 \times 6 \\
&= 45 \times 7 - 306 \times 1 \\
&= [657 - 306 \times 2] \times 7 - 306 \times 1 \\
&= 657 \times 7 - 306 \times 14 - 306 \times 1 \\
&= 657 \times 7 - 306 \times 15 \\
&= 657 \times 7 - [963 - 657 \times 1] \times 15 \\
&= 657 \times 7 - 963 \times 15 + 657 \times 15 \\
&= \boxed{657 \times 22 - 963 \times 15}.
\end{aligned}
$$

(ii) We need to find the H.C.F. of 592 and 252 and express it as a linear combination of 592 and 252.

By applying Euclid's division lemma

$592 = 252 \times 2 + 88$

Since remainder $\neq 0$, apply division lemma on divisor 252 and remainder 88

$252 = 88 \times 2 + 76$

Since remainder $\neq 0$, apply division lemma on divisor 88 and remainder 76

$88 = 76 \times 1 + 12$

Since remainder $\neq 0$, apply division lemma on divisor 76 and remainder 12

$76 = 12 \times 6 + 4$

Since remainder $\neq 0$, apply division lemma on divisor 12 and remainder 4

$12 = 4 \times 3 + 0$.

Therefore, H.C.F. = 4.

Now,

$$
\begin{aligned}
4 &= 76 - 12 \times 6 \\
&= 76 - [88 - 76 \times 1] \times 6 \\
&= 76 - 88 \times 6 + 76 \times 6 \\
&= 76 \times 7 - 88 \times 6 \\
&= (252 - 88 \times 2) \times 7 - 88 \times 6 \\
&= 252 \times 7 - 88 \times 14 - 88 \times 6 \\
&= 252 \times 7 - 88 \times 20 \\
&= 252 \times 7 - [592 - 252 \times 2] \times 20 \\
&= 252 \times 7 - 592 \times 20 + 252 \times 40 \\
&= 252 \times 47 - 592 \times 20 \\
&= \boxed{252 \times 47 + 592 \times (-20)}
\end{aligned}
$$

(iii) We need to find the H.C.F. of 506 and 1155 and express it as a linear combination of 506 and 1155.

By applying Euclid's division lemma

$1155 = 506 \times 2 + 143.$

Since remainder $\neq 0$, apply division lemma on divisor 506 and remainder 143

$506 = 143 \times 3 + 77.$

Since remainder $\neq 0$, apply division lemma on divisor 143 and remainder 77

$143 = 77 \times 1 + 66.$

Since remainder $\neq 0$, apply division lemma on divisor 77 and remainder 66

$77 = 66 \times 1 + 11.$

Since remainder $\neq 0$, apply division lemma on divisor 66 and remainder 11

$66 = 11 \times 6 + 0.$

Therefore, H.C.F. = 11.

Now,

$$
\begin{aligned}
11 &= 77 - 66 \times 1 \\
&= 77 - [143 - 77 \times 1] \times 1 \\
&= 77 - 143 \times 1 + 77 \times 1 \\
&= 77 \times 2 - 143 \times 1 \\
&= [506 - 143 \times 3] \times 2 - 143 \times 1 \\
&= 506 \times 2 - 143 \times 6 - 143 \times 1 \\
&= 506 \times 2 - 143 \times 7 \\
&= 506 \times 2 - [1155 - 506 \times 2] \times 7 \\
&= 506 \times 2 - 1155 \times 7 + 506 \times 14 \\
&= \boxed{506 \times 16 - 1155 \times 7}.
\end{aligned}
$$

(iv) We need to find the H.C.F. of 1288 and 575 and express it as a linear combination of 1288 and 575.

By applying Euclid's division lemma

$1288 = 575 \times 2 + 138.$

Since remainder $\neq 0$, apply division lemma on divisor 506 and remainder 143

$575 = 138 \times 4 + 23.$

Since remainder $\neq 0$, apply division lemma on divisor 143 and remainder 77

$138 = 23 \times 6 + 0.$

Therefore, H.C.F. = 23.

Now,

$$
\begin{aligned}
23 &= 575 - 138 \times 4 \\
&= 575 - [1288 - 575 \times 2] \times 4 \\
&= 575 - 1288 \times 4 + 575 \times 8 \\
&= \boxed{575 \times 9 - 1288 \times 4}.
\end{aligned}
$$

Real Numbers Ex 1.2 Q4

Answer :

We need to express the H.C.F. of 468 and 222 as $468x + 222y$

Where x, y are integers in two different ways.

Given integers are 468 and 222, where $468 > 222$

By applying Euclid's division lemma, we get $468 = 222 \times 2 + 24.$

Since the remainder $\neq 0$, so apply division lemma on divisor 222 and remainder 24

$222 = 24 \times 9 + 6.$

Since the remainder $\neq 0$, so apply division lemma on divisor 24 and remainder 6

$24 = 6 \times 4 + 0.$

We observe that remainder is 0. So the last divisor 6 is the H.C.F. of 468 and 222 from we have

$6 = 222 - 24 \times 9$

$\Rightarrow \quad 6 = 222 - (468 - 222 \times 2) \times 9 \qquad$ [Substituting $24 = 468 - 222 \times 2$]

$\Rightarrow \quad 6 = 222 - 468 \times 9 + 222 \times 18$

$\Rightarrow \quad 6 = 222 \times 19 - 468 \times 9$

$\Rightarrow \quad \boxed{6 = 222y + 468x}$, where $x = -9$ and $y = 19$.

*********** END **********