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- 3 Find the highest common factor (HCF) of 72 and 108
Show your working clearly.



$$72 = 2 \times 2 \times 2 \times 3 \times 3$$

$$108 = \cancel{2} \times \cancel{2} \times \cancel{3} \times \cancel{3} \times 3$$

Handwritten prime factorizations for 72 and 108. For 72, the factors are 2, 2, 2, 3, 3, with the first two 2s circled in yellow. For 108, the factors are 2, 2, 3, 3, 3, with the first two 2s crossed out with red X's and the first two 3s circled in yellow.

$$\text{HCF} = 2 \times 2 \times 3 \times 3$$

$$= 36$$

Handwritten calculation for the HCF. The expression $2 \times 2 \times 3 \times 3$ is highlighted in yellow, and the final result is 36.

(Total for Question 3 is 2 marks)



P 7 3 9 9 0 A 0 5 2 8

- 2 Find the lowest common multiple (LCM) of 28 and 105

$$28 = 2 \times 2 \times 7$$

$$105 = 3 \times 5 \times \cancel{7}$$

$$\text{LCM} = 2 \times 2 \times 7 \times 3 \times 5$$

$$= 420$$

(Total for Question 2 is 2 marks)

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January 2022 Paper 2H

- 7 Find the lowest common multiple (LCM) of 28, 42 and 63
Show your working clearly.

$$\begin{array}{l} 28 = 2 \times 2 \\ 42 = \cancel{2} \times 3 \times 7 \\ 63 = \cancel{3} \times 3 \times 7 \end{array}$$

$$\begin{aligned} \text{LCM} &= 2 \times 2 \times 3 \times 3 \times 7 \\ &= 252 \end{aligned}$$

(Total for Question 7 is 3 marks)

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P 6 9 2 0 3 A 0 9 2 8

9 $A = 2^8 \times 3^5 \times 11^4$ $B = 2^6 \times 3 \times 11^8$

(a) Find the highest common factor (HCF) of A and B .

$A =$
 $B =$

$HCF = 2^6 \times 3 \times 11^4$

(2)

(b) Find the lowest common multiple (LCM) of $2A$ and $3B$.
Give the LCM as a product of powers of its prime factors.

$2A =$
 $3B =$

$LCM = 2^8 \times 3^5 \times 11^8$

(2)

(Total for Question 9 is 4 marks)



January 2022 Paper 1HR

- 6 (a) Work out the lowest common multiple (LCM) of 36 and 120

$$36 = 2 \times 2 \times 3 \times 3$$

$$120 = \cancel{2} \times \cancel{2} \times 2 \times \cancel{3} \times 5$$

$$\text{LCM} = 2^3 \times 3^2 \times 5$$

$$= 360$$

(2)

$$A = 5^2 \times 7^4 \times 11^p$$

$$B = 5^m \times 7^{n-5} \times 11$$

m, n and p are integers such that
 $m > 2$
 $n > 10$
 $p > 1$

- (b) Find the highest common factor (HCF) of A and B
 Give your answer as a product of powers of its prime factors.

$$11^p \rightarrow p > 1$$

$$A = 5 \times 5$$

$$B = 5 \times 5 \times 5$$

$$5^m \rightarrow m > 2$$

$$7 \times 7 \times 7 \times 7$$

$$7 \times 7 \times 7 \times 7 \times 7$$

$$7^{n-5} \rightarrow n > 10$$

$$11 \times 11$$

$$\text{HCF} = 5^2 \times 7^4 \times 11$$

(2)

(Total for Question 6 is 4 marks)





January 2019 P2H

- 6 (a) Find the highest common factor (HCF) of 96 and 120

$$96 = 2 \times 2 \times 2 \times 2 \times 2 \times 3$$

$$120 = 2 \times 2 \times 2 \times 3 \times 5$$

$$\text{HCF} = 2^3 \times 3$$

$$= 24$$

(2)

$$A = 2^3 \times 5 \times 7^2 \times 11$$

$$B = 2^4 \times 7 \times 11$$

$$C = 3 \times 5^2$$

- (b) Find the lowest common multiple (LCM) of A , B and C .

$$A = 2 \times 2 \times 2 \times 5 \times 7 \times 7 \times 11$$

$$B = 2 \times 2 \times 2 \times 2 \times 7 \times 11$$

$$C = 3 \times 5 \times 5$$

(2)

(Total for Question 6 is 4 marks)

$$\text{LCM} = 2^4 \times 3 \times 5^2 \times 7^2 \times 11$$

$$= 646800$$

9

$$A = 2^3 \times 3^2 \times 5^2 \times 11$$

$$B = 2^4 \times 3 \times 5^4 \times 13$$

Find the lowest common multiple (LCM) of A and B .
Give your answer as a product of powers of prime numbers.

$A =$ 2 2 2 3 3 5 5 11
 $B =$ ~~2~~ ~~2~~ ~~2~~ 2 ~~3~~ 5 ~~5~~ ~~5~~ 5 5 13

$$\text{LCM} = 2^4 \times 3^2 \times 5^4 \times 11 \times 13$$

(Total for Question 9 is 2 marks)



P 6 6 3 0 1 A 0 1 1 2 8

- 7 (a) Find the highest common factor (HCF) of 200 and 420

$$200 = 2^3 \times 5^2$$

$$420 = 2^2 \times 3 \times 5 \times 7$$

$$200 = \begin{array}{c} 2 \\ 2 \\ 2 \end{array} \begin{array}{c} 2 \\ 2 \end{array}$$

$$420 = \begin{array}{c} 2 \\ 2 \end{array} 3 \begin{array}{c} 5 \\ \times \end{array} 7$$

$$\text{HCF} = 2^2 \times 5 = 20$$

(2)

$$A = 2^3 \times 3 \times 5 \times 7^2$$

$$B = 2 \times 3^2 \times 7$$

$$C = 3 \times 5^2 \times 11$$

- (b) Find the lowest common multiple (LCM) of A , B and C
Write your answer as a product of powers of prime factors.

$$A = \begin{array}{c} 2 \\ 2 \\ 2 \end{array} \begin{array}{c} 3 \\ \times \end{array} \begin{array}{c} 5 \\ \times \end{array} \begin{array}{c} 7 \\ 7 \end{array}$$

$$B = \begin{array}{c} 3 \\ 3 \end{array} \begin{array}{c} 7 \\ \times \end{array}$$

$$C = \begin{array}{c} 5 \\ 5 \end{array} 11$$

$$\text{LCM} = 2^3 \times 3^2 \times 5^2 \times 7^2 \times 11$$

(2)

(Total for Question 7 is 4 marks)



8 $A = 3^5 \times 5 \times 7^3$
 $B = 2^3 \times 3 \times 7^4$

(a) (i) Find the Highest Common Factor (HCF) of A and B .

$$\begin{array}{l} A = \quad \quad \quad \textcircled{3} \ 3 \ 3 \ 3 \ 3 \quad 5 \quad \textcircled{7} \ \textcircled{7} \ \textcircled{7} \\ B = \ 2 \ 2 \ 2 \quad \textcircled{\times} \quad \quad \quad \textcircled{\times} \ \textcircled{\times} \ \textcircled{\times} \ 7 \end{array}$$

$$\text{HCF} = 3 \times 7^3$$

(ii) Find the Lowest Common Multiple (LCM) of A and B .

$$\text{LCM} = 2^3 \times 3^5 \times 5 \times 7^4$$

(2)

$A = 3^5 \times 5 \times 7^3$
 $B = 2^3 \times 3 \times 7^4$
 $C = 2^p \times 5^q \times 7^r$

Given that

the HCF of B and C is $2^3 \times 7$

the LCM of A and C is $2^4 \times 3^5 \times 5^2 \times 7^3$

(b) find the value of p , the value of q and the value of r .

If HCF of B & $C = 2^3 \times 7$

$$\begin{array}{l} B = \textcircled{2} \ \textcircled{2} \ \textcircled{2} \ 3 \quad \textcircled{7} \ 7 \ 7 \ 7 \\ C = \textcircled{2} \ \textcircled{2} \ \textcircled{2} \ ? \quad 5^q \ \textcircled{7} \end{array}$$

$$r = 1$$

LCM of A & $C = 2^4 \times 3^5 \times 5^2 \times 7^3$

$$\begin{array}{l} A = \quad \quad \quad 3 \ 3 \ 3 \ 3 \ 3 \quad \textcircled{5} \quad 7 \ 7 \ 7 \\ C = \ 2 \ 2 \ 2 \ 2 \quad \quad \quad \textcircled{\times} \ 5 \end{array}$$

$$p = 4$$

$$p = 4$$

$$q = 2$$

$$r = 1$$

(2)

(Total for Question 8 is 4 marks)



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8

$$A = 3^2 \times 5^4 \times 7 \quad B = 3^4 \times 5^3 \times 7 \times 11$$

(a) Find the highest common factor (HCF) of A and B .

$$\begin{array}{l} A = \underbrace{3}_{} \underbrace{3}_{} \underbrace{5}_{} \underbrace{5}_{} \underbrace{5}_{} 5 \underbrace{7}_{} \\ B = \cancel{3} \cancel{3} 3 3 \cancel{5} \cancel{5} \cancel{5} \cancel{7} 11 \end{array}$$

$$HCF = 3^2 \times 5^3 \times 7$$

(2)

(b) Find the lowest common multiple (LCM) of A and B .

$$LCM = 3^4 \times 5^4 \times 7 \times 11$$

(2)

(Total for Question 8 is 4 marks)



P 6 0 2 6 1 A 0 7 2 4

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- 3 (a) Find the highest common factor (HCF) of 56 and 84
Show your working clearly.

$$56 = 2^3 \times 7 \quad = \quad \begin{array}{|c|c|} \hline 2 & 2 \\ \hline \times & \times \\ \hline \end{array} 2 \quad \begin{array}{|c|} \hline 7 \\ \hline \times \\ \hline \end{array}$$

$$84 = 2^2 \times 3 \times 7 \quad = \quad \begin{array}{|c|c|} \hline 2 & 2 \\ \hline \times & \times \\ \hline \end{array} \quad 3 \quad \begin{array}{|c|} \hline 7 \\ \hline \times \\ \hline \end{array}$$

$$\text{HCF} = 2^2 \times 7$$

(2)

- (b) Find the lowest common multiple (LCM) of 60 and 72
Show your working clearly.

$$60 = 2^2 \times 3 \times 5 \quad = \quad \begin{array}{|c|c|} \hline 2 & 2 \\ \hline \times & \times \\ \hline \end{array} \quad \begin{array}{|c|} \hline 3 \\ \hline \times \\ \hline \end{array} \quad 5$$

$$72 = 2^3 \times 3^2 \quad = \quad \begin{array}{|c|c|} \hline 2 & 2 \\ \hline \times & \times \\ \hline \end{array} \quad 2 \quad \begin{array}{|c|} \hline 3 \\ \hline \times \\ \hline \end{array} \quad 3$$

$$\text{LCM} = 2^3 \times 3^2 \times 5$$

(2)

(Total for Question 3 is 4 marks)

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P 6 8 7 9 6 A 0 5 2 8

12 $P = 3^3 \times 5^2 \times 7$
 $Q = 3^2 \times 5 \times 7^2$

(a) Write down the highest common factor (HCF) of P and Q

$P =$ $\left(\begin{array}{c} 3 \\ \cancel{3} \end{array} \right) \left(\begin{array}{c} 3 \\ \cancel{3} \end{array} \right) 3$ $\left(\begin{array}{c} 5 \\ \cancel{5} \end{array} \right) 5$ $\left(\begin{array}{c} 7 \\ \cancel{7} \end{array} \right) 7$
 $Q =$ $\left(\begin{array}{c} \cancel{3} \\ \cancel{3} \end{array} \right) \left(\begin{array}{c} \cancel{5} \\ \cancel{5} \end{array} \right) \left(\begin{array}{c} \cancel{7} \\ \cancel{7} \end{array} \right) 7$

$HCF = 3^2 \times 5 \times 7$

(1)

$P = 3^3 \times 5^2 \times 7$
 $Q = 3^2 \times 5 \times 7^2$

(b) Work out the value of $P^3 \times Q$

Give your answer in the form $3^x \times 5^y \times 7^z$ where x , y and z are positive integers.

$P^3 = (3^3 \times 5^2 \times 7)^3$
 $= 3^9 \times 5^6 \times 7^3$

$P^3 \times Q = 3^9 \times 5^6 \times 7^3 \times 3^2 \times 5 \times 7^2$
 $= 3^{11} \times 5^7 \times 7^5$

(2)

(Total for Question 12 is 3 marks)

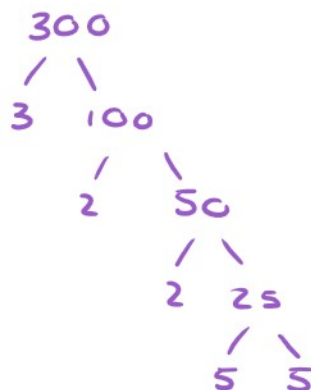


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- 8 (a) Write 300 as a product of its prime factors.
Show your working clearly.



$$\underline{2^2 \times 3 \times 5^2}$$

(2)

$$A = 2 \times 2 \times 2 \times 3 \times 3 \times 5$$

$$B = 2 \times 2 \times 3 \times 3 \times 3 \times 5$$

- (b) Find the lowest common multiple (LCM) of $5A$ and $7B$
Show your working clearly.

$$\begin{array}{l}
 5A = \textcircled{2} \textcircled{2} 2 \quad \textcircled{3} \textcircled{3} \quad \textcircled{5} 5 \\
 7B = \textcircled{\cancel{2}} \textcircled{\cancel{2}} \quad \textcircled{\cancel{3}} \textcircled{\cancel{3}} \quad 3 \quad \textcircled{\cancel{5}} \quad 7
 \end{array}$$

$$LCM = 2^3 \times 3^3 \times 5^2 \times 7$$

(2)

(Total for Question 8 is 4 marks)



P 7 2 7 9 0 A 0 1 1 2 8

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11 $A = 2^5 \times 5 \times 7^2$

$B = 2^3 \times 5^3 \times 7^4$

- (a) Write down the highest common factor (HCF) of $5A$ and $2B$
Give your answer as a product of prime factors.

$$\begin{array}{l} 5A = \underbrace{(2)(2)(2)(2)}_{\text{4 twos}} 2 \quad \underbrace{(5)(5)}_{\text{2 fives}} \quad \underbrace{(7)(7)}_{\text{2 sevens}} \\ 2B = \underbrace{(\cancel{2})(\cancel{2})(\cancel{2})(\cancel{2})}_{\text{4 twos crossed out}} \quad \underbrace{(\cancel{5})(\cancel{5})}_{\text{2 fives crossed out}} 5 \quad \underbrace{(\cancel{7})(\cancel{7})}_{\text{2 sevens crossed out}} 7 7 \end{array}$$

$$\text{HCF} = 2^4 \times 5^2 \times 7^2$$

(2)

$A = 2^5 \times 5 \times 7^2$

$B = 2^3 \times 5^3 \times 7^4$

- (b) Work out the value of $(AB)^2$
Give your answer as a product of prime factors.

$$\begin{aligned} AB &= A \times B \\ &= 2^5 \times 5 \times 7^2 \times 2^3 \times 5^3 \times 7^4 \\ AB &= 2^8 \times 5^4 \times 7^6 \end{aligned}$$

$$\begin{aligned} (AB)^2 &= (2^8 \times 5^4 \times 7^6)^2 \\ &= 2^{16} \times 5^8 \times 7^{12} \end{aligned}$$

(2)

(Total for Question 11 is 4 marks)



P 7 3 4 6 6 A 0 1 1 2 4

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7 $A = 5^3 \times 7^3 \times 11^6$ and $B = 5^6 \times 7^2 \times 11^4$

Find the highest common factor (HCF) of A and B

Give your answer as a product of powers of its prime factors.

$$\begin{array}{l} A = \underbrace{5 \times 5 \times 5}_{\text{3 times}} \quad \underbrace{7 \times 7 \times 7}_{\text{3 times}} \quad \underbrace{11 \times 11 \times 11 \times 11 \times 11 \times 11}_{\text{6 times}} \\ B = \underbrace{\cancel{5} \times \cancel{5} \times \cancel{5} \times 5 \times 5 \times 5}_{\text{6 times}} \quad \underbrace{\cancel{7} \times \cancel{7}}_{\text{2 times}} \quad \underbrace{\cancel{11} \times \cancel{11} \times \cancel{11} \times \cancel{11}}_{\text{4 times}} \end{array}$$

$$\text{HCF} = 5^3 \times 7^2 \times 11^4$$

(Total for Question 7 is 2 marks)



P 7 3 4 6 5 A 0 9 2 8




6 $A = 2^3 \times 5^4 \times 7 \times 11$

$B = 2^2 \times 5^2 \times 7^2$

$C = 2^2 \times 5^3 \times 7^4$

Find the highest common factor (HCF) of A , B and C

Write your answer as a product of prime factors.

$A =$ 
 $B =$ 
 $C =$ 

$HCF = 2^2 \times 5^3 \times 7^2$

(Total for Question 6 is 2 marks)



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10 $A = 2 \times 3^{43}$
 $B = 16 \times 3^{37}$

(a) Find the highest common factor (HCF) of A and B .

$$16 = 2^4$$

$$A = 2 \times 3^{43} = 2 \times \overbrace{3 \times 3 \times \dots \times 3}^{37} \times 3^6$$

$$B = 2^4 \times 3^{37} = \cancel{2} \times 2 \times 2 \times 2 \times \overbrace{3 \times 3 \times \dots \times 3}^{37}$$

$$\text{HCF} = 2 \times 3^{37}$$

(1)

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(b) Express the number $A \times B$ as a product of powers of its prime factors.
 Give your answer in its simplest form.

$$A \times B = 2 \times 3^{43} \times 2^4 \times 3^{37}$$

$$= 2^1 \times 2^4 \times 3^{43} \times 3^{37}$$

$$= 2^5 \times 3^{80}$$

(2)

(Total for Question 10 is 3 marks)

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P 6 2 6 5 2 A 0 1 1 2 8