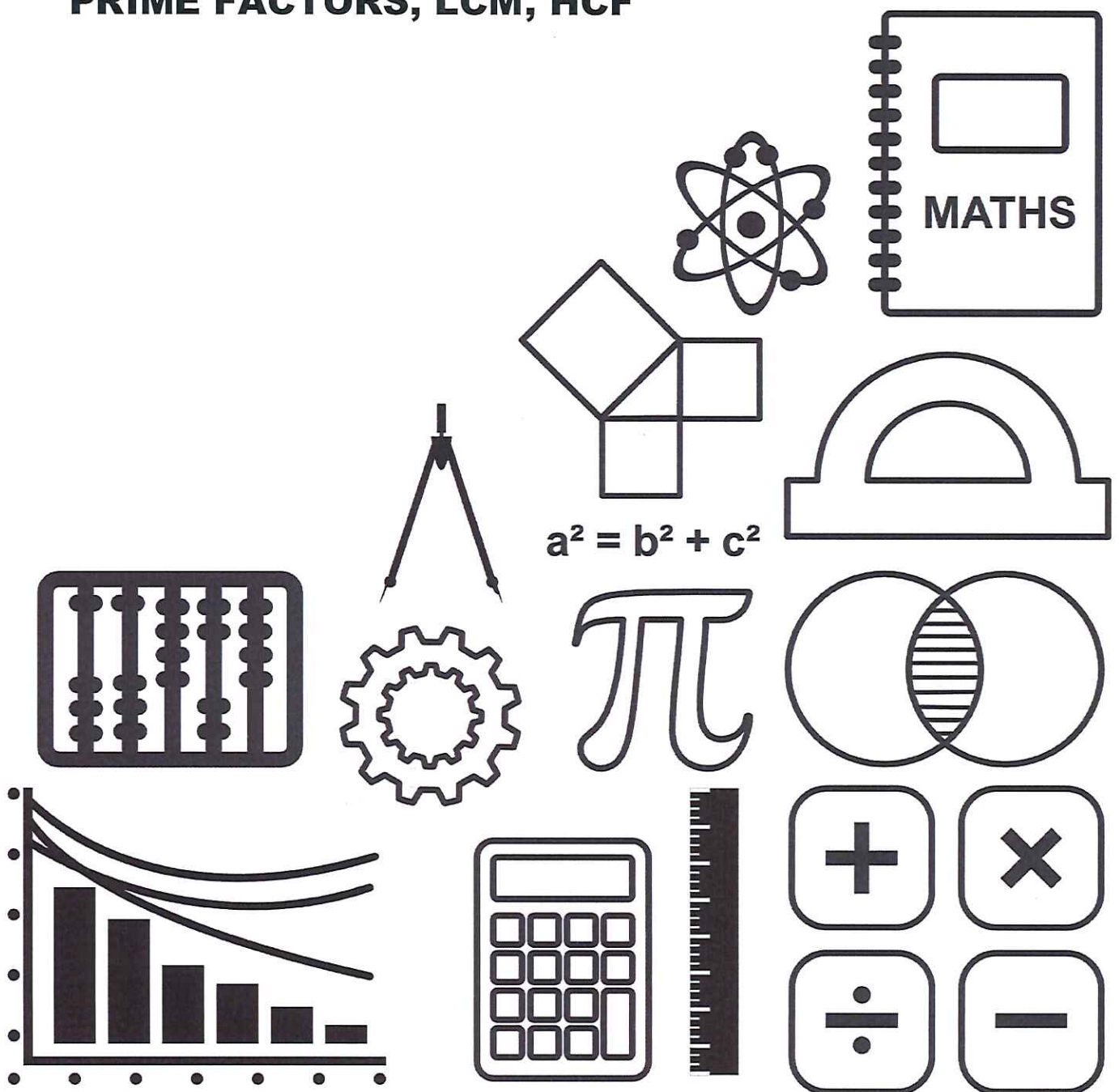


SOLUTIONS

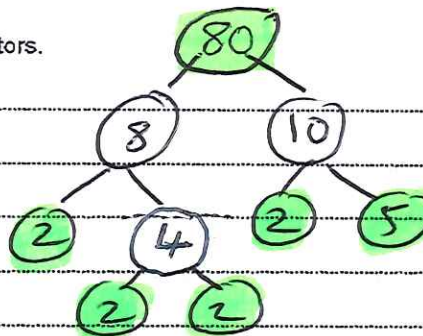
GCSE TOPIC BOOKLET PRIME FACTORS, LCM, HCF



1.

(a) Express 80 as a product of prime factors.

[2]

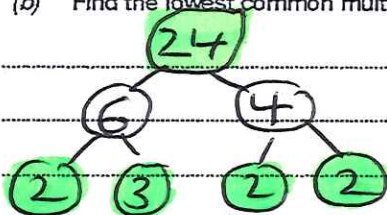


$$80 = 2 \times 2 \times 2 \times 2 \times 5$$

$$\text{or } 80 = 2^4 \times 5$$

(b) Find the lowest common multiple of 80 and 24.

[2]



$$24 = 2 \times 2 \times 2 \times 3$$

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

$$\text{or } 24 = 2^3 \times 3$$

$$\text{LCM} = 240$$

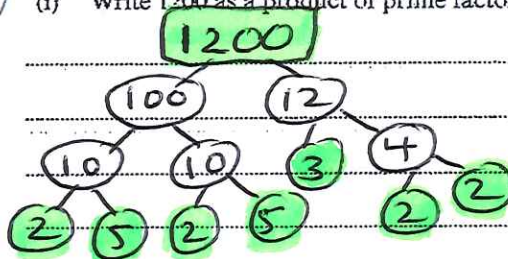
(c) Find the highest common factor of 80 and 24.

[1]

$$\text{HCF} = 2^3 = 8$$

(d) (i) Write 1200 as a product of prime factors using index notation.

final answer must be in index form



$$1200 = 2 \times 2 \times 2 \times 2 \times 3 \times 5 \times 5$$

$$1200 = 2^4 \times 3 \times 5^2$$

[3]

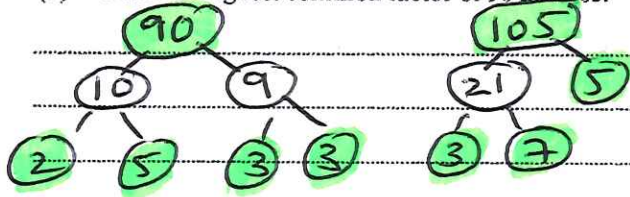
(ii) Write down the smallest possible number by which 1200 has to be multiplied to create a perfect square.

3

[1]

2.

(a) Find the highest common factor of 90 and 105.



$$90 = 2 \times 3^2 \times 5$$

$$105 = 3 \times 5 \times 7$$

$$\text{HCF} = 3 \times 5 = 15$$

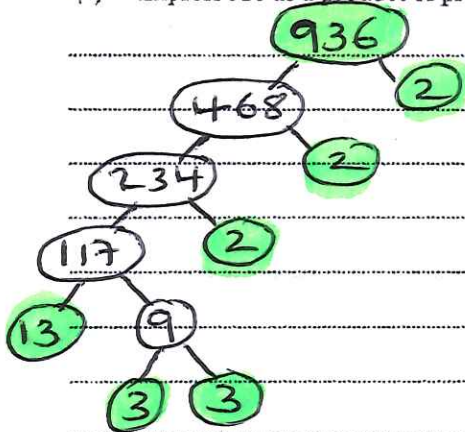
[2]

(b) Find the lowest common multiple of 90 and 105.

$$\text{LCM} = 2 \times 3^2 \times 5 \times 7 = 630$$

[2]

(c) Express 936 as a product of prime numbers in index form.



$$936 = 2 \times 2 \times 2 \times 3 \times 3 \times 13$$

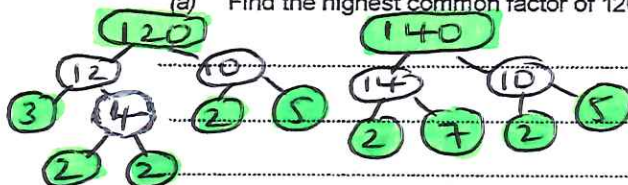
$$\underline{936 = 2^3 \times 3^2 \times 13}$$

[3]

↑
final answer must
be in index form

3.

(a) Find the highest common factor of 120 and 140. [1]

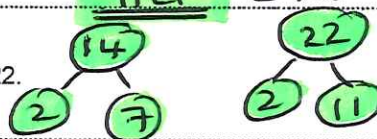


$$120 = 2^3 \times 3 \times 5$$

$$140 = 2^2 \times 7 \times 5$$

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

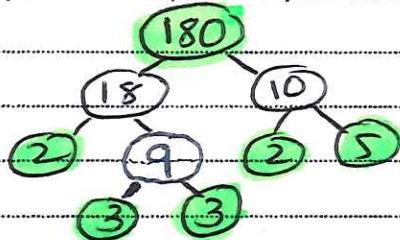
(b) Find the lowest common multiple of 14 and 22. [2]



$$\text{LCM} = 2 \times 7 \times 11$$

$$\text{LCM} = 154$$

(c) Express 180 as a product of prime numbers using index notation. [3]



$$180 = 2 \times 2 \times 3 \times 3 \times 5$$

$$180 = 2^2 \times 3^2 \times 5$$

4.

Jack makes the following statements.

- 36 and 60 are both common factors of 180.
- The highest common factor of 36 and 60 is **not** a factor of 180.

Decide whether each of Jack's statements is correct.

You must show your working and give a reason for your answer.

- $60 \times 3 = 180$ and $36 \times 5 = 180$ so 36 and 60 are both factors of 180



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

$$60 = 2^2 \times 3 \times 5$$

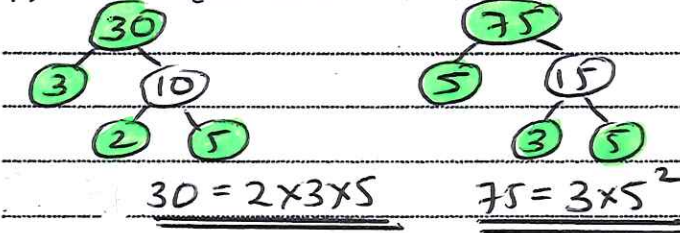
HCF of 36 and 60

$$= 2^2 \times 3 = 12$$

- In Jack's second statement he says the HCF of 36 & 60 is not a factor of 180. This is wrong. $12 \times 15 = 180$ so the HCF of 36 and 60 is a factor of 180. [3]

5.

(a) Find the highest common factor of 30 and 75.



HCF = 3 x 5 = 15

[1]

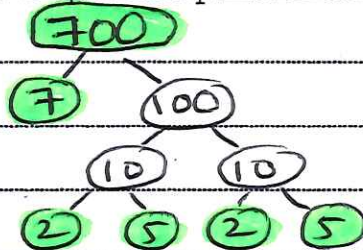
(b) Find the lowest common multiple of 6 and 21.



[2]

6.

(a) Express 700 as a product of prime numbers in index form.



700 = 2² x 5² x 7

[3]

(b) Use your result in part (a) to write down the smallest multiple of 700 which is a perfect square.

If we x 7 we get 2² x 5² x 7² and all the powers are even. ∴ Perfect square.

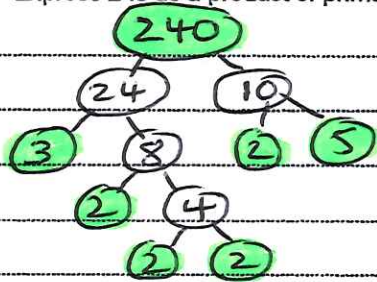
= 4900

[1]

7.

(a) Express 240 as a product of prime numbers in index form.

[3]



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

$$= \underline{2^4 \times 3 \times 5}$$

(b) Use your answer to part (a) to write down 240^2 as a product of prime numbers in index form.

[1]

$$= 240 \times 240 = (2^4 \times 3 \times 5) \times (2^4 \times 3 \times 5)$$

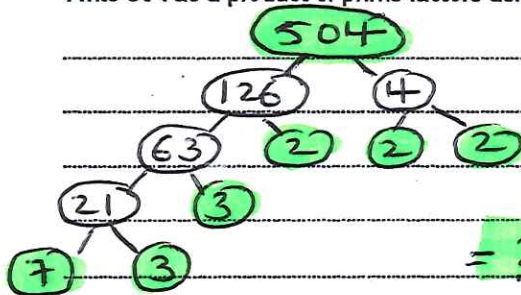
$$= \underline{2^8 \times 3^2 \times 5^2}$$

8.

(a)

Write 504 as a product of prime factors using index notation.

[3]



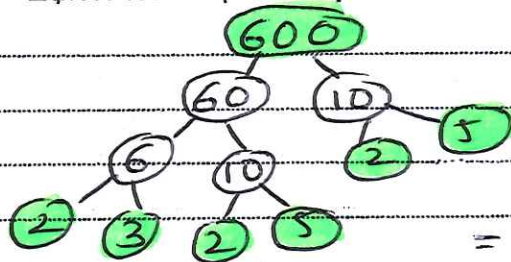
$$= 2 \times 2 \times 2 \times 3 \times 3 \times 7$$

$$= \underline{2^3 \times 3^2 \times 7}$$

(b)

(i) Express 600 as a product of prime factors using index form.

[3]



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

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

(ii) What is the least number 600 should be multiplied by to give an answer that is a square number?

[1]

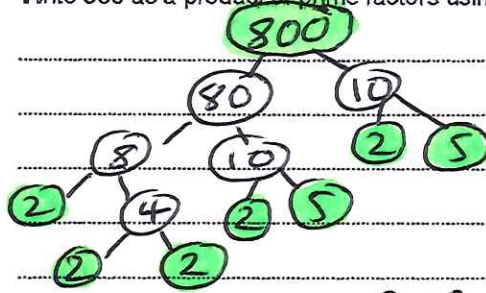
$$2 \times 3 = \underline{6}$$

(because all the powers would then be even)

9.

Write 800 as a product of prime factors using index notation.

[3]



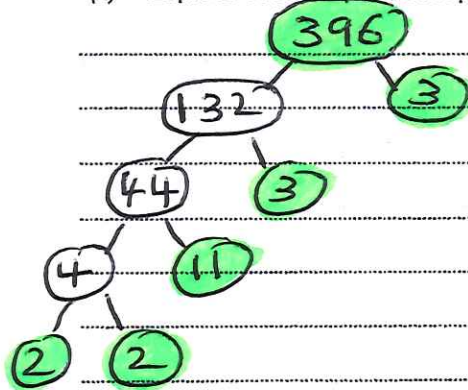
$$= 2 \times 2 \times 2 \times 2 \times 2 \times 5 \times 5$$

$$= 2^5 \times 5^2$$

10.

(a) Express 396 as a product of prime numbers in index form.

[3]



$$= 2 \times 2 \times 3 \times 3 \times 11$$

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

(b) r^2 is the smallest square number that is a multiple of 396.

$$11 \times 396 = y^2$$

→ complicated way of asking for a perfect square, so all even powers

Write down the value of y .

$$y^2 = 2^2 \times 3^2 \times 11^2$$

[2]

$$y = 2 \times 3 \times 11 = 6 \times 11 = 66$$

$$y = 66$$