Factors, Multiples, Squares, Cubes & Primes

Practice Worksheet (Foundation · Target Grade 5)

I Do

Here is a list of numbers.

$$6 \quad 9 \quad 12 \quad 15 \quad 21 \quad 27 \quad 32 \quad 49$$

From the numbers in the list, write down

(a) a multiple of 8

..... *(1 mark)*

(b) a factor of 36

..... *(1 mark)*

(c) a square number

..... *(1 mark)*

(d) a cube number.

..... *(1 mark)*

(Total for Question is 4 marks)

We Do

Here is a list of numbers.

$$4 \quad 8 \quad 14 \quad 18 \quad 25 \quad 28 \quad 36 \quad 64$$

From the numbers in the list, write down

(a) a multiple of 7

..... *(1 mark)*

(b) a factor of 32

..... *(1 mark)*

(c) a square number

..... *(1 mark)*

(d) a cube number.

..... *(1 mark)*

(Total for Question is 4 marks)

You Do 1

Here is a list of numbers.

$$5 \quad 11 \quad 16 \quad 20 \quad 24 \quad 36 \quad 45 \quad 125$$

From the numbers in the list, write down

(a) a prime number

..... *(1 mark)*

(b) a factor of 40

..... *(1 mark)*

(c) a multiple of 9

..... *(1 mark)*

(d) a cube number.

..... *(1 mark)*

(Total for Question is 4 marks)

You Do 2

Here is a list of numbers.

$$7 \quad 13 \quad 18 \quad 27 \quad 30 \quad 42 \quad 64 \quad 81$$

From the numbers in the list, write down

(a) a prime number

..... *(1 mark)*

(b) a factor of 54

..... *(1 mark)*

(c) a number that is both a square number and a cube number

..... *(1 mark)*

(d) a multiple of both 6 and 7.

..... *(1 mark)*

(Total for Question is 4 marks)

You Do 3

(a) Write down all the factors of 28.

..... *(2 marks)*

(b) Write down a prime number between 30 and 40.

..... *(1 mark)*

(c) Work out the value of $5^2 + 2^3$.

..... *(1 mark)*

(Total for Question is 4 marks)

Challenge 1

(a) Write down a number that satisfies all three of the following conditions:

- it is a factor of 48
- it is a multiple of 4
- it is **not** a square number.

..... *(2 marks)*

(b) Find two different prime numbers that add up to a square number greater than 20 and less than 40.

..... and ..... *(2 marks)*

(Total for Question is 4 marks)

Challenge 2

(a) Express 72 as a product of its prime factors.
Give your answer in index form.

..... *(2 marks)*

(b) Find the smallest positive integer k such that $72k$ is a cube number.
Show your working clearly.

$k =$ ..... *(2 marks)*

(Total for Question is 4 marks)

Extreme Challenge

A positive integer N satisfies all four of the following conditions:

- N is a multiple of 12
- N is a factor of 180
- N is **not** a multiple of 5
- N has exactly 9 factors in total.

(a) Find the value of N.
Show all of your working clearly.

$N =$ ..... *(3 marks)*

(b) Find the smallest positive integer m such that $N \times m$ is a cube number.
Show your working clearly.

$m =$ ..... *(2 marks)*

(Total for Question is 5 marks)

Worked Answers

I Do
(a) 32 *(*$8 \times 4 = 32$*)*
(b) 6, **9**, or **12** *(any one of these divides* 36 *exactly)*
(c) 9 or **49** *(*$3^2 = 9$, $7^2 = 49$*)*
(d) 27 *(*$3^3 = 27$*)*

We Do
(a) 14 or **28**
(b) 4 or **8**
(c) 4, **25**, **36**, or **64**
(d) 8 or **64** *(*$2^3 = 8$, $4^3 = 64$*)*

You Do 1
(a) 5 or **11**
(b) 5 or **20**
(c) 36 or **45**
(d) 125 *(*$5^3 = 125$*)*

You Do 2
(a) 7 or **13**
(b) 18 or **27**
(c) 64 *(*$8^2 = 64$ *and* $4^3 = 64$*)*
(d) 42 *(*$6 \times 7 = 42$*)*

You Do 3
(a) Factor pairs of 28: 1×28, 2×14, 4×7.
All factors: **1**, **2**, **4**, **7**, **14**, **28**.
(b) 31 or **37**.
(c) $5^2 + 2^3 = 25 + 8 =$ **33**.

Challenge 1
(a) Multiples of 4 that are factors of 48: $4, 8, 12, 16, 24, 48$.
Remove the square numbers ($4 = 2^2$ and $16 = 4^2$).
Answer: Any one of **8**, **12**, **24**, or **48**.

(b) The square numbers between 20 and 40 are 25 and 36.
Possible pairs of different primes:
- For 25: **2 and 23**
- For 36: **5 and 31**, **7 and 29**, **13 and 23**, or **17 and 19**.

Challenge 2
(a) $72 = 8 \times 9 = 2^3 \times 3^2$.
Answer: $2^3 \times 3^2$.

(b) For $72k = 2^3 \times 3^2 \times k$ to be a cube number, every prime power must be a multiple of 3.
The power of 2 is already 3, and we need one more factor of 3 to raise 3^2 to 3^3:
$2^3 \times 3^2 \times 3 = 2^3 \times 3^3 = 216 = 6^3$.
Therefore, **k = 3**.

Extreme Challenge
(a) 1. List the multiples of 12 that are factors of 180:
$12, \quad 36, \quad 60, \quad 180$.
2. Eliminate multiples of 5 (60 and 180), leaving 12 and 36.
3. Count the factors of each remaining candidate:
- Factors of 12: $1, 2, 3, 4, 6, 12$ (6 factors).
- Factors of 36: $1, 2, 3, 4, 6, 9, 12, 18, 36$ (9 factors).
Therefore, **N = 36**.

(b) Write 36 as a product of its prime factors:
$36 = 2^2 \times 3^2$.
To make $36 \times m$ a cube number, each prime index must be increased to a multiple of 3:
Multiply by $2^1 \times 3^1 = 6$ to get $2^3 \times 3^3 = 216 = 6^3$.
Therefore, **m = 6**.