Physics, Foundation Programme – Problem Solving Exercises 1

1. Make a cross if the number belongs to the given subset of real numbers:

	3	-3	3.33	$\frac{2}{9}$	π	$-\sqrt{2}$	10
Natural number $\mathbb{N}$							
Integer $\mathbb{Z}$							
Rational number $\mathbb{Q}$							
Irrational number $\mathbb{I}$							

a:

	3	-3	3.33	$\frac{2}{9}$	π	$-\sqrt{2}$	10
Natural number $\mathbb{N}$	x						x
Integer $\mathbb{Z}$	x	x					x
Rational number $\mathbb{Q}$	x	x	x	x			x
Irrational number $\mathbb{I}$					x	x	

2. Evaluate the expressions:
   a) $(-5)^2(-2)^3$ **a:** -200
   b) $4 + (3-8)^2$ **a: 29**
   c) $28 \div (-7+5)^2$ **a: 7**
   d) $(3-5)^2(3^2-5^2)$ **a: -64**

3. What is the prime factorization of each number:
   a) 35 **a:** $5 \cdot 7$
   b) 16 a: $2 \cdot 2 \cdot 2 \cdot 2$
   c) 18 a: $2 \cdot 3 \cdot 3$

4. Find the greatest common factor (GCF) for each pair of numbers.
   a) 8 and 24 a: 8
   b) 20 and 25 a: 5
   c) 16 and 40 a: 8
5. Find the least common multiple (LCM) of numbers:
   a) 6 and 7 a: 42
   b) 16 and 24 a: 48
   c) 10 and 35 a: 70
6. Express each fraction in the simplest form:
   a) $\frac{4}{20}$ a: 1/5
   b) $\frac{9}{27}$ a: 1/3
   c) $\frac{18}{20}$ a: 9/10

7. Write a mixed number for each improper fraction:
   a) $\frac{24}{5}$ a: 4+4/5
   b) $\frac{33}{12}$ a: 2+9/12=2+3/4
8. Write improper fraction for each mixed number:
   a) $1\frac{7}{10}$ a: 17/10
   b) $6\frac{3}{5}$ a: 33/5
9. Add or subtract, express in the simplest form:
   a) $\frac{3}{16}+\frac{5}{16}$ a: 8/16=1/2
   b) $\frac{25}{60}-\frac{15}{60}$ a: 10/60=1/6
   c) $\frac{4}{12}+\frac{2}{15}$ a: 28/60=7/15
   d) $\frac{5}{9}-\frac{1}{3}$ a: 2/9
   e) $7\frac{4}{10}-3\frac{1}{10}$ a: 4+3/10
   f) $3\frac{1}{2}+5\frac{1}{4}$ a: 8+3/4
10. Find the multiplicative reciprocal:
    a) $\frac{5}{7}$ a: 7/5
    b) $5\frac{1}{2}$ a: 2/11
    c) 4 a: 1/4
11. Multiply or divide, express in the simplest form:
    a) $\frac{2}{5}\times\frac{7}{9}$ a: 14/45
    b) $\frac{4}{7}\times\frac{21}{24}$ a: 1/2
    c) $\frac{3}{4}\times\frac{5}{11}$ a: 15/44
    d) $10\frac{2}{9}\times 2\frac{13}{16}$ a: 28+3/4

e) $8\frac{4}{5} \times 5\frac{5}{8}$ a: 49+1/2

f) $\frac{1}{5} \div \frac{2}{3}$ a: 3/10

g) $\frac{13}{19} \div \frac{26}{27}$ a: 27/38

h) $\frac{21}{26} \div \frac{12}{13}$ a: 7/8

12. Round each decimal to the indicated place.
    a) 1.7432; tenth a: 1.7
    b) 49.096; hundredths a: 49.10
    c) 158,890; 3 significant digits a:159,000
    d) 19.39498; 5 significant digits a: 19.395
13. Simplify the following expression using the correct number of significant digits:
    a) 5.012 km + 3.4 km + 2.33 km a: 10.7 km
    b) 45 g – 8.3 g a: 37 g
    c) 54 m / 6.5 s a: 8.3 m/s
14. Express each number using scientific notation
    a) 12,589.3 a: 1.25893×10^4
    b) 545,250,000,000,000 a: 5.4525×10^{14}
    c) 0.0000000939 a: 9.39×10^{-8}
    d) 0.000052 a: 5.2×10^{-5}
15. Express each number using decimal form
    a) $3.90 \cdot 10^{-6}$ a: 0.00000390
    b) $8.72 \cdot 10^{-3}$ a: 0.00872
    c) $7.900 \cdot 10^{4}$ a: 79,000
16. While heated, water in a pot increased temperature from 50 degrees of Celsius to 90 degrees of Celsius in 10 minutes. Write the fact as an unit rate.

A: 4 degC/min

17. A car accelerated from 0 meters per second (m/s) to 30 meters per second (m/s) in 5 seconds (s). Express the fact as an unit rate.

A: 6 m/s^2

18. Give the percent of each number:
    a) 30% of 90 a: 27
    b) 5% of 300 a:15
    c) 25% of 64 a: 16

19. 20 is 25% of what number? A:80

20. 36 is 18% of what number? A: 200

21. What percent of 50 is 2.5? a: 5%

22. What percent of 52 is 13? a: 25%