A Level Physics Preparation (Y12 Induction)

Complete the 5 worksheets provided on mathematical skills in the AQA link below. PowerPoints are provided on the same web link if you need assistance:

http://www.aqa.org.uk/resources/science/as-and-a-level/teach/maths-skills-briefings

Units worksheet
Mathematics for A-level Science

Convert the following numbers into metres:

1. 3 km

2.

3.

4.

5. 5.1 µm

6.

7.

8.

Simplify the following units:

1. $cm \times cm$

2. $km^2 \times km$

3. $nm^2 \times nm^{-1}$

4. $\dfrac{kg \ m}{m}$

5. $\dfrac{cm^3}{cm}$

6. $\dfrac{kg \ cm^3}{cm}$

7. $\dfrac{cm}{cm^2}$

8. $\dfrac{g \ cm^2}{cm^{-1}}$

9. Concrete has a density of $2400 \ kg \ m^{-3}$. What volume of concrete would have a mass of 96 kg?

10. What would this volume be in a) dm^3 and b) cm^3

Indices worksheet
Mathematics for A-level Science

Practice your understanding

Simplify the following expressions:

1. $x^3 \times x^4$

2. $y^9 \div y^4$

3.

4.

5.

6.

7.

8.

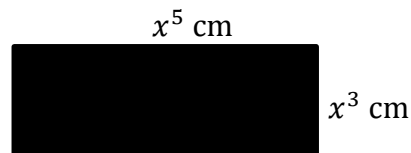Solve the following equations for x

9. $2^{x+1} = 2^4$

10. $3^{x-2} + 1 = 28$

11. $2^{x+6} = 128$

12. $2(3^x)^2 = 162$

13. $7^{x+4} = 343$

14. $\dfrac{x^3 \times x^4}{x^5} = 64$

15. Find the area of the following rectangle. Write your answer in simplified form.

x^5 cm

x^3 cm

16. The moon is approximately 4×10^5 kilometres away. If an astronaut was to travel to the moon and back 3 times, how far would he have travelled in space?

17. If that same astronaut was to travel to the moon and back 10^3 times, how far would he have travelled in space?

Standard form worksheet

Mathematics for A-level Science

Practice your understanding

Convert the following numbers into standard form:

1. 32 000   5.

2.   6.

3.   7.

4.   8.

Convert the following numbers from standard form into decimal notation:

9. 3.26×10^4 13. 8×10^{-6}

10. 8.4×10^{-3} 14. 1.3×10^8

11. 7.29×10^7 15. 2.3×10^{-4}

12. 1.26×10^2 16. 5.001×10^6

17. Using the formula Circumference = $3.14 \times$ radius, and given that the mean radius of the Earth is 6 378 000 m, calculate the approximate circumference of the Earth leaving your answer in standard form to two significant figures.

18. There are 86 400 seconds in a day. Calculate the number of seconds in a year leaving your answer in standard form to two significant figures.

19. The current world population is approximately 7.4×10^9 people. The United Kingdom population accounts for 0.88% of the total world population. Using this information, approximate the number of people living in the United Kingdom leaving your answer as a decimal number.

Ratio worksheet
Mathematics for A-level Science

Practice your understanding

Simplify the following ratios (Example $6:4 = 3:2$):

1. $120:50$

2. $64:24$

3.

4.

5.

6.

7.

8.

Find x by scaling the ratio.

9. $1:2 = 4:x$

10. $8:3 = x:9$

11. $25:10 = x:2$

12. $x:160 = 2:8$

13. $49:x = 2:4$

14. $58.5:18 = x:4$

15. A toy is made from red bricks and yellow bricks.
    Number of red bricks: Number of yellow bricks = 5:2.
    There are 210 more red bricks and yellow bricks.

    How many red bricks are in the toy?

16. There are 100 balls in a bag. The balls are red, blue, green or white. The ratio of blue to red is 5:1. There are twice as many blue as green. $\frac{1}{4}$ of the balls are green.

    How many white balls are in the bag?

17. One day, 460 people visit a zoo. 280 are adults. The ratio of women to men is 4:3. 180 are children. $\frac{3}{5}$ of them are boys. Jane says that altogether there were more females visiting the zoo.

    Show that she is correct.

Plotting equations worksheet

Mathematics for A-level Science

Practice your understanding

On a separate sheet of paper, plot the following equations on separate axis for $-5 < x < 5$

1. $y = 2x + 3$

2. $y = -x + 3$

3.

4.

5.

6. The price of a phone call is made up of a connection charge of 5p, and an additional cost of 2p per minute. Letting P represent the total price and T the length of the phone call, explain the equation $P = 2T + 5$

   Plot this equation for $0 < t < 4$

7. The weight of a beaker filled with water is made up of the weight of the glass beaker and 1 extra gram per ml of water inside the beaker.

   For a beaker that weighs 250 g, explain the equation $Weight = 250 + W$

   Plot this relationship for $0 < W < 250$

8. To convert between the Celsius and Fahrenheit temperature scales, there exists the formula $F = \frac{9}{5}C + 32$

   Plot this relationship for $0 < C < 100$