1. Formulae and variation

1. Make U the subject of the formula (3mks)

$$X = \frac{U^2 V}{U^2 2W}$$

2. A quantity P varies partly as t and partly as the square of t. When t = 20, P = 45 and when t = 24, P = 60. Find P when t = 32. (4 mks)

3. A quantity V is partly constant and partly varies inversely as the square of W. If W = 2 when V = 14 and W = 3 when V = 9. write an equation connecting V and W and hence find V when W = 6.

(4mks)

4. Given that $T = \frac{1}{2}\sqrt{\frac{2}{x+y}}$ express y in terms of T and X. (3mks)

5. Make t the subject of the formula. (3 marks)

$$x = \sqrt{\frac{1 + kt}{kt - 1}}$$

6. Three quantities P, Q and R are such that P varies directly as the cube of Q and inversely as the square of R.

   a) Given that P = 16 when Q = 2 and R = 3. Determine the value of R when P= 288 and Q = 4 (5 marks)

   b) Q decreases by 30% while R increases by 40%. Find the percentage decrease or increase in P.

   (5 marks)

7. Make P the subject of the formula in $x = \sqrt{\frac{y(p-y)}{p-1}}$ (3mks)

8. P varies directly as Q and inversely as the square root of R.
   Find the percentage decrease in P if Q decreases by 4 % when R increases by 44 % . (4mks)

9. Given that $q = \frac{m+1}{2m-1}$ express $\frac{3q-1}{3q+1}$ in terms of m in simplified form

   (3 marks)

10. P varies as the square of R. R. varies as the square of T. When P = 18, R = 3 and T = 5. Express P in terms of T hence find P when T = 10.

11. Make r the subject of the formula.

$$v = \sqrt{\frac{r}{r+c}}$$

12. X varies as the cube of Y and inversely as square root of Z, X = 6 when Y = 3 and Z= 25.
    (a) Find;
        (i) An expression connecting X,Y,Z
        (ii) X when Y = 7 and Z = 9
        (iii) Y when X = 8 and Z = 16
    b) If Y is increased by 20% and Z is decreased by 36%, find the percentage increase in X

13. Make **b** the subject of the formula;

$$K = \frac{ab}{b-a}$$

14. Find a quadratic equation whose roots are $2.5 + \sqrt{3}$ and $2.5 - \sqrt{3}$, expressing it in the form $ax^2 + bx + c = 0$ Where a, b and c are integers

15. A quantity **Z** varies directly as the square of x and inversely as the square root of y. If **x** increases by 20% and **y** decreases by 36%, find the percentage change in **Z**

16. The fourth terms of a G.P is 48 and the seventh term is 384. Find the common ratio and hence calculate the sum of the first six terms

17. A quantity **P** varies directly as the square of **Q** and inversely as quantity **R**. If **P** = 2 when **Q** = 4 and **R**=6, find **P** when **Q** = 8 and **R**= 4

18. **B** varies partly as the square of **M** and partly as the inverse of **N**. **B,M** and **N** are such that when **M**=2, **N**= ½ , **B**=96 while when **M**= 3 , **N**=2, **B** = 46. Write an expression for **B** in terms of **M** and **N**.

19. Solve for **x** and **y.**

$$\frac{3x}{y-1} = 1$$

$$(2x + 2) : (y - 5) = 1 : 2$$

20. Make **x** the subject of the formula.. $P = \left(\frac{x-1}{x+2}\right)$

21. Make **d** the subject of the formula given that:-

$$a^2 = \sqrt{\frac{1+d^2}{b^2} + \frac{b}{3}}$$

22. **Z** varies jointly as the square of **x** and inversely as the square of **y**. When **x** = 10 and **y** = 4 then **z** = 15
    (a) Find **z** in terms of **x** and **y**
    (b) Find the value of **x** when **z** = 8 and **y** = 12

23. A quantity **R** partly varies as **n** and partly as the square root of **n**. When **n** = 9 **R** = 42 and when **n** = 25 **R** = 100. Find **R** when **n** = 16.

24. Make **b** the subject of the formula.

$$a = \frac{bd}{\sqrt{b^2 + d}}$$

25. **P** varies party as **Q** and partly as the square root of **Q**. When **Q** = 4, **P** = 22 and when **Q** = 9, **P** = 42. Find the value of **P** when **Q** = 25.

26. Make **C** the subject of the formula

$$b = \sqrt{k-aC}$$

hence find the value of **C** when **K**= 1, **a** = 4 and **b** = 2

27. The velocity of water flowing through a pipe is inversely proportional to the square of the radius of the pipe. If the velocity of the water is 30cm/s when the radius of the pipe is 2cm. Find the velocity of water when the radius of the pipe is 4cm

28. Make x the subject of the formula

$$P = 3\sqrt{\dfrac{xy}{z+x}}$$

29. Three quantities **x**, **y** and z are such that **x** varies partly as y and partly as the inverse of the square of Z . When **x** = 6, **y** = 3 and z= 2. When x = 8, y = 5 and z= 1. Find the value of x when y = 10 and z= 8

30. The eleventh term of an AP is four times the second term. If the sum of the first seven terms of the AP is 175, find the first term and the common difference

31. The resistance of an electrical conductor is partly constant and partly varies as the temperature. When the temperature is $20^{\circ}C$, the resistance is 55 ohms. When the temperature is $28^{\circ}C$, the resistance is 58 ohms. Find the resistance when the temperature is $60^{\circ}C$

32. Expand $\left(1 - \dfrac{1}{(2x)^{-1}}\right)^{5}$ up to the term in x^3. Hence or otherwise evaluate $(0.98)^5$ to 4 d.p