Unit 8 Project

1. 42, 37, 32,
   -5 -5

$a = 42. \quad d = -5$

n^{th} term $= a + (n-1)d$

1st - 42

2nd - 37

3rd - 32

4th - $a + 3d = 42 + 3(-5) = 42 - 15 = 27.$

5th - $a + 4d = 42 + 4(-5) = 42 - 20 = 22.$

6th - $a + 5d = 42 + 5(-5) = 42 - 25 = 17.$

7th - $a + 6d = 42 + 6(-5) = 42 - 30 = 12$

8th - $a + 7d = 42 + 7(-5) = 42 - 35 = 7$

terms. 42, 37, 32, 27, 22, 17, 12, 7, ...

2. $a_1 = 2 \quad d = 6.$

n^{th} term $= a + (n-1)d$

24th term $= a + 23d$

$= 2 + 23(6)$

$= 2 + 138$

$= 140$

3. $-4, x, y, z, 16 \ldots$

$a = -4.$

~~5th term $= ar^4 = -4r^4 = 16$~~

~~$-r^4 = 4.$~~

5th term $= a + (n-1)d$

$16 = -4 + (5-1)d.$

$16 = -4 + 4d.$

$4d = 20.$

$d = 5.$

$x = a + d = -4 + 5 = 1$

$y = a + 2d = -4 + 10 = 6.$

$z = a + 3d = -4 + 15 = 11$

4. $S_n = \frac{n}{2}(2a + (n-1)d)$

$S_{31} = \frac{31}{2}(2 \times 7 + (31-1)d)$

$a + 30d = 127$

$7 + 30d = 127$

$30d = 120$

$d = 4$

$S_{31} = \frac{31}{2}(14 - (30 \times 4))$

$S_{31} = \frac{31}{2} \times \frac{53}{1}$

$S_{31} = 1643$

5. 81, 27, 9

$\times \frac{1}{3}$ $\times \frac{1}{3}$

$r = \frac{1}{3}$.

$a = 81$

n^{th} term $= ar^{n-1}$

1st – 81

2nd – 27

3rd – 9

$4^{th} - ar^3 = 81 \times \left(\frac{1}{3}\right)^3 = 81 \times \frac{1}{27}$

$= 3$

$5^{th} - ar^4 = 81 \times \left(\frac{1}{3}\right)^4 = 81 \times \frac{1}{81}$

$= 1$

$6^{th} - ar^5 = 81\left(\frac{1}{3}\right)^5 = 81 \times \frac{1}{243}$

$= \frac{1}{3}$

terms

81, 27, 9, 3, 1, $\frac{1}{3}$, ...

6. $a_1 = 5 \quad r = -2$.

8^{th} term $= ar^7$

$= 5(-2)^7$

$= 5(-128)$

$= -640$.

7. 7, x, y, 189, ...

$a = 7$

4^{th} term $= ar^3 = 189$

$7r^3 = 189$

$r^3 = 27$

$r = \sqrt[3]{27} = 3$.

$x = ar = 7 \times 3 = 21$

$y = ar^2 = 7 \times 3^2 = 63$.

8. $a_1 = 125, \quad r = \frac{2}{5}, \quad n = 4$

$S_n = \frac{a(1-r^n)}{(1-r)}$

$S_4 = \frac{125\left(1-\left(\frac{2}{5}\right)^4\right)}{\left(1-\frac{2}{5}\right)}$

$S_4 = \frac{125\ (1-0.0256)}{(1-0.4)}$

$S_4 = \frac{121.8}{0.6} = 203$.

Find the sum of each series, if it exists.

9. $\sum_{k=3}^{15}(14-2k)$.

$(14-6)+(14-8)+(14-10)+(14-12)$
$+(14-14)+(14-16)+(14-18)$
$+(14-20)+(14-22)+(14-24)$
$+(14-26)+(14-28)+(14-30)$
$+(14-32)+(14-34)$

$= 8+6+4+2+0-2-4-6-8-10-12-14-16-18-20$

$= -52$.

10. $91+85+79+\ldots+(-29)$.

$a = 91$
$d = 85-91 = -6$.

$n^{th} = a+(n-1)d = -29$.

$91+(n-1)-6 = -29$
$(n-1)-6 = -120$
$n-1 = 20$
$n = 20+1$
$n = 21$

$S_{21} = \frac{21}{2}(2\times 91+(21-1)-6)$

$S_{21} = \frac{21}{2}(182-120)$

$S_{21} = \frac{21}{2}\times\frac{31}{62} = 651$

$S_{21} = 651$

11. $a_1 = 2$, $a_{n+1} = a_n+3$.

n^{th} term $= a+(n-1)d$
$a_n = 2+(n-1)d$.
$a_{n+1} = 2+nd$.

$a_{n+1} = a_n+3$
$2+nd = 2+(n-1)d+3$
$nd = nd-d+3$
$0 = -d+3$
$d = 3$.

1st $- a = 2$
2nd $- a+d = 2+3 = 5$
3rd $- a+2d = 2+6 = 8$
4th $- a+3d = 2+9 = 11$
5th $- a+4d = 2+12 = 14$

terms $2, 5, 8, 11, 14, \ldots$

12. $a_1 = -4$, $a_{n+1} = a_n+n^2$.

$-4+nd = -4+(n-1)d+n^2$
$nd = nd-d+n^2$.
$d = n^2$.

1st $- a_1 = -4$
2nd $- a+d = a+n^2 = -4+2^2 = 0$
3rd $- a+2d = a+2n^2 = -4+2(3)^2$
$= -4+18$
$= 14$
4th $- a+3d = a+3n^2$
$= -4+3(4)^2$
$= -4+48 = 44$.
5th term $a+4d = -4+4(5)^2$
$= 96$.

terms $-4, 0, 14, 44, 96, \ldots$

13. 13, 15, 12, 10, 4, 16, 17, 22, 9.

4, 9, 10, 12, 13, 15, 16, 17, 22.

Median = 13.

Mode - no mode.

$$\text{Mean} = \frac{\Sigma x}{\Sigma f} = \frac{118}{9} = 13.11.$$

$$\text{Variance} = \frac{\Sigma (xi - \bar{x})^2}{n}$$

$$= \frac{216.89}{9}$$

$$= 24.10.$$

$$\text{Standard deviation} = \sqrt{\text{variance}}$$

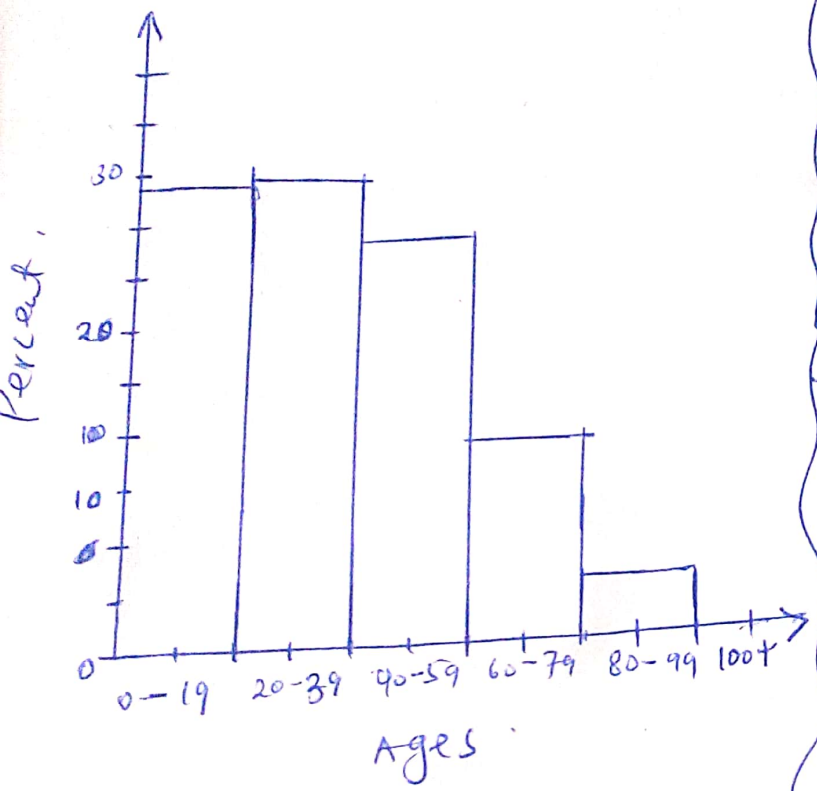
$$= \sqrt{24.10}$$

$$= 4.909$$

14.

14.

Age.	Percent.
0 – 19	28.7
20 – 39	29.3
40 – 59	25.5
60 – 79	13.3
80 – 99	3.2
100 +	0.0.



Positively skewed.

15. $\bar{x} = 94$.

$\sigma = 8$.

102 is 1 standard deviation above 94.

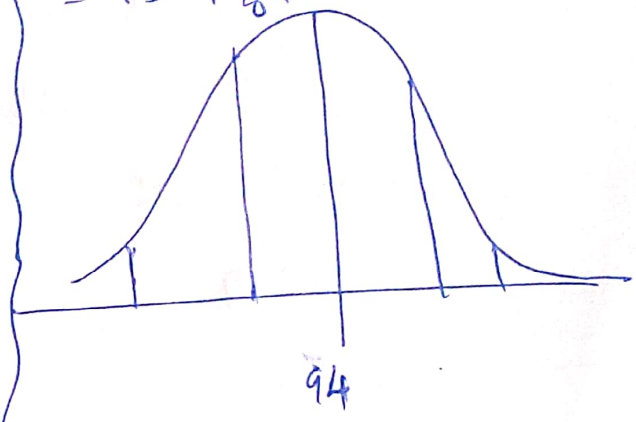
below 94 there is 50%

between 94 and 102 there is 34.1% of teams.

$100 - (50 + 34.1)$ above 102.

$= 102 - 84.1$

$= 15.9\%$.



16. Margin of error $= Z \times \sqrt{\frac{P(1-P)}{600}}$

$= 1.96 \times \sqrt{\frac{0.33(1-0.33)}{600}}$

$= 1.96 \times \sqrt{0.0003685}$

$= 0.03762$.

17. $p' = \frac{x}{n} = \frac{195}{200} = 0.725$

Margin of error = E

= Confidence coefficient x Standard error of $\hat{p}$.

Z value at 95% = 1.96.

Standard error of $p = \sqrt{\frac{P(1-P)}{n}}$

$p = \sqrt{\frac{0.75(0.275)}{200}}$

$p = 0.0316$

$E = 1.96 \times 0.0316$

$= 0.0619.$