# S2 DISTRICT EXAMINATION MARKING GUIDE 2022/23.

1. $\frac{4r^2-t}{5}$ for $r=3, t=1$

$= \frac{4(3)^2-1}{5} = \frac{4(9)-1}{5}$ 1 mark 1 mark

$= \frac{36-1}{5} = \frac{35}{5} = 7$ 1 mark

2. $\left(2^{-3} \times 16^{\frac{1}{2}}\right)\left(81^{\frac{3}{4}} \times 27^{-\frac{1}{3}}\right)$

$= \left(2^{-3} \times 2^{4\left(\frac{1}{2}\right)}\right)\left(3^{4\left(\frac{3}{4}\right)} \times 3^{3\left(-\frac{1}{3}\right)}\right)$

$= 2^{-3} \times 2^{2} \times 3^{3} \times 3^{-1}$ 2 marks

$= 2^{-3+2} \times 3^{3-1}$ 1 mark

$= 2^{-1} \times 3^{2} = \frac{1}{2} \times 9$

$= \frac{9}{2} = 4.5$ 1 mark

3. $(2x-3)^2 - (x+1)^2$

$= (2x-3)(2x-3) - ((x+1)(x+1))$ 1 mark

$= 4x^2 - 6x - 6x + 9 - (x^2 + x + x + 1)$ 1 mark

$= 4x^2 - 12x + 9 - x^2 - 2x - 1$

$= 3x^2 - 10x + 8$. 1 marks

4. $n(\xi) = 40$.

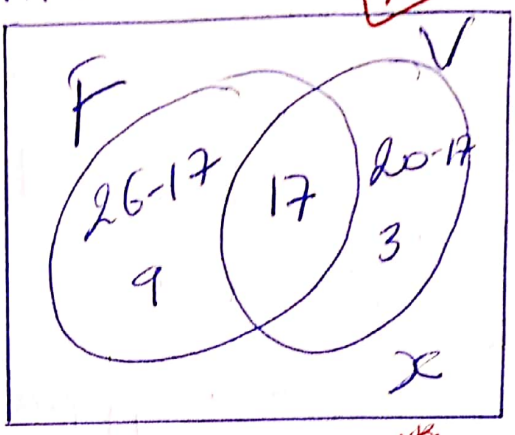
F: foot ball $\Rightarrow n(F) = 26$

V: volley ball $n(V) = 20$

$n(F \cap V) = 17$

$n(F \cup V)' = x$

2 marks




For $9+17+3+x = 40$ 1 mark

$x = 40 - 29$

$x = 11$

The students who play no game is 11 students. 1 mark

5. $\sqrt{12} \times 3\sqrt{60} \times \sqrt{45}$

$= \sqrt{4 \times 3} \times 3(\sqrt{4 \times 15} \times \sqrt{9 \times 5})$ 1 mark

$= 2\sqrt{3} \times 6\sqrt{15} \times 3\sqrt{5}$

$= (2 \times 6 \times 3)\sqrt{15} \times \sqrt{3 \times 5}$

$= 36 \times \sqrt{15} \times \sqrt{15}$ 2 marks

$= 36 \times 15$

$= 540$ 1 mark

6. $\frac{\sqrt{5}}{\sqrt{15}+\sqrt{10}} = \frac{\sqrt{5}}{\sqrt{5}(\sqrt{3}+\sqrt{2})}$

$= \frac{1}{\sqrt{3}+\sqrt{2}}$ 1 mark

$= \frac{\sqrt{3}-\sqrt{2}}{(\sqrt{3}+\sqrt{2})(\sqrt{3}-\sqrt{2})}$ 1 mark

$= \frac{\sqrt{3}-\sqrt{2}}{\sqrt{9}-\sqrt{6}+\sqrt{6}-\sqrt{4}}$ 1 mark

$= \frac{\sqrt{3}-\sqrt{2}}{3-2}$

$= \sqrt{3}-\sqrt{2}$ 1 mark

7. $p = 100{,}000$ Ruf
$I = 16{,}000$ Ruf
$t = 2$ years
$r = ?$

$I = \frac{p \times r \times t}{100}$ 1 mark

$16{,}000 = \frac{100{,}000 \times 2 \times r}{100}$ 2 mark

$\frac{16{,}000}{2000} = \frac{2000r}{2000}$

$\Rightarrow r = 8\%$ 1 mark

8. $\frac{32^{\frac{3}{4}} \times 16^{0} \times 8^{\frac{5}{4}}}{128^{\frac{3}{2}}}$

$= \frac{2^{5(\frac{3}{4})} \times 2^{0} \times 2^{3(\frac{5}{4})}}{2^{7(\frac{3}{2})}}$ 0.5 marks

$= \frac{2^{\frac{15}{4}} \times 2^{\frac{15}{4}}}{2^{\frac{21}{2}}} = \frac{2^{\frac{15}{4}+\frac{15}{4}}}{2^{\frac{21}{2}}}$

$= 2^{\frac{30}{4}} \times 2^{-\frac{21}{2}}$ 2 marks

$= 2^{\frac{15}{2}-\frac{21}{2}} \times 2^{-\frac{6}{2}}$

$= 2^{-3}$ 1 mark $= \frac{1}{2^3} = \frac{1}{8}$ 0.5 marks

19. (a) $x^2 - 4x + 3 = 0$

$x^2 - 3x - 1x + 3 = 0$ 1 marks

$(x^2 - 3x) + (-x + 3) = 0$

$x(x-3) - 1(x-3) = 0$ 1 mark

$(x-3)(x-1) = 0$

$x - 3 = 0, \quad x - 1 = 0$

$x = 3, \quad x = 1$

$S = \{1, 3\}$. 1 mark.

(b) $3x^2 + 13x + 12 = 0$ 2 marks

$3x^2 + 4x + 9x + 12 = 0$

$(3x^2 + 4x) + (9x + 12) = 0$

$3x(3x+4)+3(3x+4)=0$

$(3x+4)(x+3)=0$ 1 marks

$3x+4=0,\ x+3=0$

$x=-\frac{4}{3},\quad x=-3$

$S=\{-3,-\frac{4}{3}\}$. 1 marks

10. (a) $f(x)=\frac{2x-4}{3}$, $f^{-1}(x)=?$

$\frac{y}{1}=\frac{2x-4}{3}$

$3y=2x-4$ 0.5 marks

$2x-4=3y$

$\frac{2x}{2}=\frac{3y+4}{2}$ 1 mark.

$x=\frac{3y+4}{2}$ 0.5 marks

Interchange $x$ and $y$

$y=\frac{3x+4}{2}$ 1 marks

$f^{-1}(x)=\frac{3x+4}{2}$ 1 marks

(b) $f(x)=2x+3,\ g(x)=3x-1$

$(fog)(x)=f[g(x)]$

$=2(3x-1)+3$ 1 mark

$=6x-2+3$

$(fog)(x)=6x+1$ 2 marks

11. $\begin{cases}3x+7y=15\\5x+2y=-4\end{cases}$

$\begin{pmatrix}3 & 7\\5 & 2\end{pmatrix}\begin{pmatrix}x\\y\end{pmatrix}=\begin{pmatrix}15\\-4\end{pmatrix}$ 1 mark

$\Delta=\begin{vmatrix}3 & 7\\5 & 2\end{vmatrix}=6-35=-29$

$\Delta=-29$ 0.5 marks.

$\Delta x=\begin{vmatrix}15 & 7\\-4 & 2\end{vmatrix}=30-(-28)=58$

$\Delta x=58$ 0.5 marks

$\Delta y=\begin{vmatrix}3 & 15\\5 & -4\end{vmatrix}=-12-75=-87$

$\Delta y=-87$ 0.5 marks

$x=\frac{\Delta x}{\Delta}=\frac{58}{-29}=-2$ 0.5

$y=\frac{\Delta y}{\Delta}=\frac{-87}{-29}=3$ 0.5 marks

$S(x,y)=\{(-2,3)\}$. 0.5 marks

12. Let $x$: be the 1st number

$y$: be the 2nd number 1 marks

$\begin{cases}x+y=120 & \text{--(i)}\\x-y=18 & \text{--(ii)}\end{cases}$ 0.5 marks

$\frac{2x}{2}=\frac{102}{2}$

$x=51$ 0.5 marks

Substitute $x$ into (i)

$x + y = 120$

$51 + y = 120$

$y = 120 - 51$

$y = 69.$

Therefore 1st number is 51 (1 marks)

2nd number is 69.

13.

$\frac{1}{2}(2x-4) \leq 2x-1$

$\frac{1}{2}x - \frac{1}{6}x \leq \frac{2}{3}$

$\frac{2x-4}{2} \leq 2x-1$

$\frac{3x-x}{6} \leq \frac{2}{3}$ (1 marks)

$2x-4 \leq 4x-2$

$2x \leq 4$ (1 marks)

$2x-4x \leq -2+4$

$2x \leq 4.$

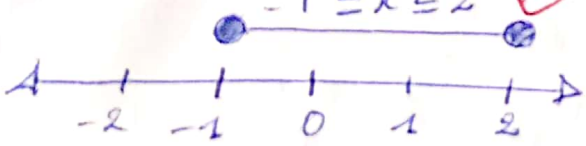
$-2x \leq 2$

$2x \leq 4$ (0.5 marks)

$x \geq -1$

$x \leq 2.$ (0.5 marks)

$-1 \leq x \leq 2$ (1 marks)






14.

(a) $\overline{AB} = 6x$? $36$

$\overline{EF} = 2x^2 - 3x$

$EF = \frac{1}{2}AB$ (2 marks)

$2x^2 - 3x = \frac{1}{2}(6x^2 - 36)$

$2x^2 - 3x = 3x^2 - 18$

$2x^2 - 3x^2 - 3x + 18 = 0$

$-x^2 - 3x + 18 = 0$

$x^2 + 3x - 18 = 0$ (2 marks)

$-3 \quad 6$

$(x^2 - 3x) + (6x - 18) = 0$

$x(x-3) + 6(x-3) = 0$

$(x-3)(x+6) = 0$

$x = 3$, or $x = -6$, (4 marks)

(b) $AC^2 = AB^2 + BC^2$ (2 Mark)

$AB^2 + BC^2 = AC^2$

$AB^2 = AC^2 - BC^2$

$\sqrt{AB^2} = \sqrt{25^2 - 7^2}$ (1 mark)

$AB = \sqrt{625 - 49}$ (2 marks)

$AB = \sqrt{576} = 24$ (1 mark)

∴ the 3rd side is 24 cm. (1 marks)

15. (a) (i) $f(x) = x^3 + 5x^2 - 4x - 20$

for $x - 2 = 0$

$x = 2$ — 2 marks

$f(2) = (2)^3 + 5(2)^2 - 4(2) - 20$

$= 8 + 20 - 8 - 20$

$= 28 - 28$

$f(2) = 0$ — 3 marks

(ii)

| | | | | |
|---|---|---|---|---|
| 2 | 1 | 5 | −4 | −20 |
| | | 2 | 14 | 20 |
| | 1 | 7 | 10 | 0 |

3 marks

$f(x) = (x^2 + 7x + 10)(x - 2)$

$= (x^2 + 2x + 5x + 10)(x - 2)$

$= [x(x+2) + 5(x+2)](x-2)$

$f(x) = (x+2)(x+5)(x-2)$ — 3 marks

(iii) $f(x) = 0$,

$(x+2)(x+5)(x-2) = 0$ — 2 marks

$x + 2 = 0, x + 5 = 0, x - 2 = 0$

$x = -2, x = -5, x = 2$

$S = \{-5, -2, 5\}$ — 2 marks

16. (a)

Let $x$: the cost of a pencil.

$y$: the cost of a book

$3x + 4y = 1350$

$3x + 4y = 1350$ — (i)

$5x + 6y = 2050$

$5x + 6y = 2050$ — (ii)

2 marks

$3x + 4y = 1350 \mid 5$

$5x + 6y = 2050 \mid 3$

$15x + 20y = 6750$

$-(15x + 18y = 6150)$

$\frac{2y}{2} = \frac{600}{2}$ — 2 marks

$y = 300$

Substitute $y$ into eqn (i)

$3x + 4y = 1350$

$3x + 4(300) = 1350$

$3x = 1350 - 1200$

$\frac{3x}{3} = \frac{150}{3}$

$x = 50$ — 2 marks

∴ The cost of 10 pencils

$= 50 \times 10 = 500$ Rwf — 1 mark

∴ The cost of 20 books $= 300 \times 20$

$= 6,000$ Rwf — 1 mark

(3) the production before is 800 l in week

The increase $= \frac{800 \times 30}{100}$

$= 240\ l$

After the increase the production is $800\ l + 240\ l$

$= 1040\ l$.

A cow produce 1040 l for the following week

17. $\left.\begin{aligned} 2x - y &= -1 \quad \text{--(i)} \\ x - 2y &= 4 \quad \text{--(ii)} \end{aligned}\right\}$

for equation (i)

$2x - y = -1$

$y = 2x + 1$ 1 Marks

Variation table of x & y

| x | -2 | 0 | 2 |
|---|---|---|---|
| y | -3 | 1 | 5 |

2 Marks

for equation (ii)

$x - 2y = 4$

$-2y = -x + 4$

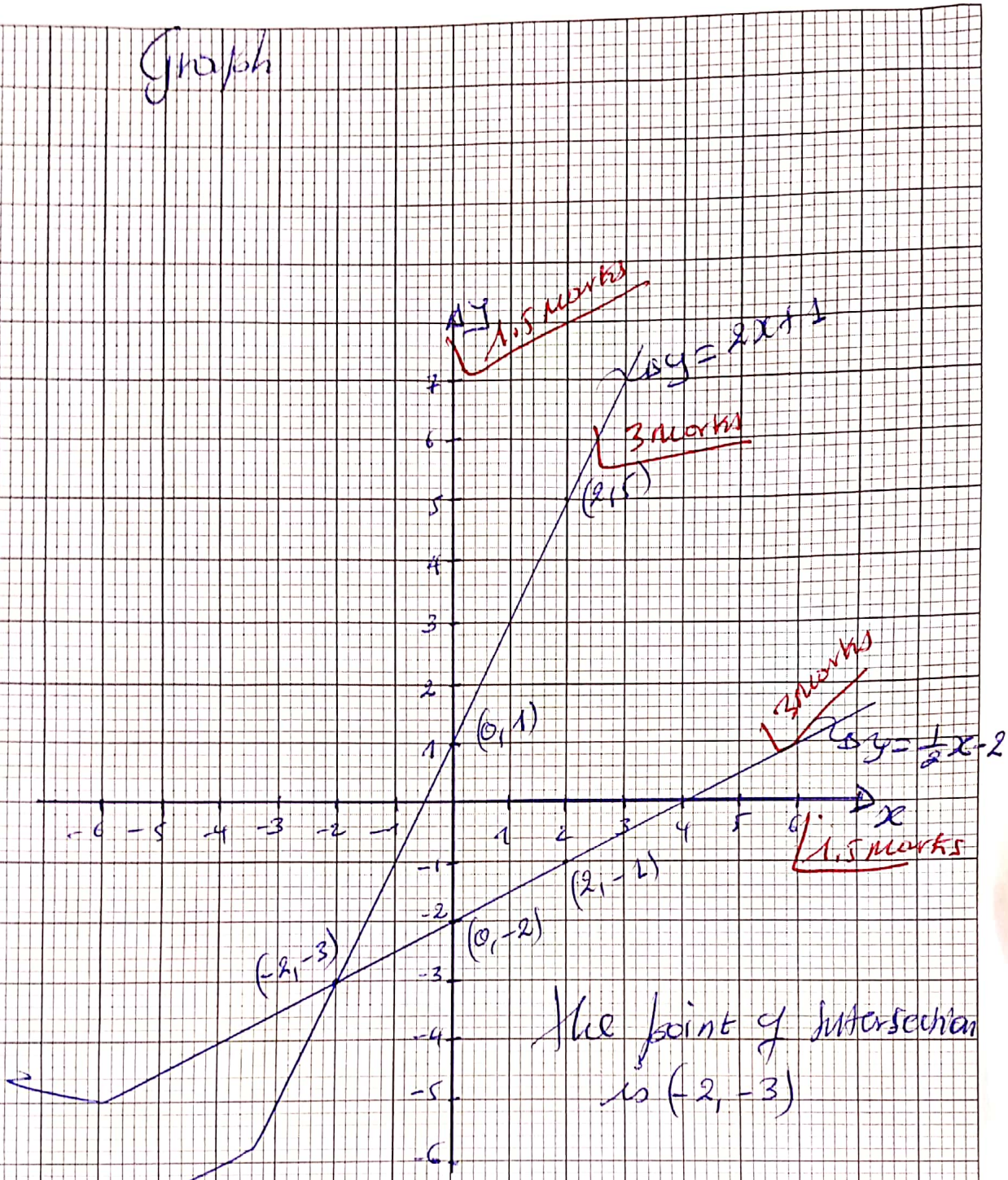
$y = \frac{1}{2}x - 2$ 1 Marks

Variation table of x & y

| x | -2 | 0 | 2 |
|---|---|---|---|
| y | -3 | -2 | -1 |

2 Marks

Graph




The point of intersection is (-2, -3)

18.(a)

$\vec{a} = \begin{pmatrix} 3 \\ 4 \end{pmatrix}$, $\vec{b} = \begin{pmatrix} 1 \\ 6 \end{pmatrix}$ & $\vec{c} = \begin{pmatrix} 2 \\ -3 \end{pmatrix}$

(i) $\vec{a} + \vec{b} = \begin{pmatrix} 3 \\ 4 \end{pmatrix} + \begin{pmatrix} 1 \\ 6 \end{pmatrix}$ 1 Mark

$\vec{a} + \vec{b} = \begin{pmatrix} 4 \\ 10 \end{pmatrix}$ 2 marks

(ii) $\vec{a} - \vec{c} = \begin{pmatrix} 3 \\ 4 \end{pmatrix} - \begin{pmatrix} 2 \\ -3 \end{pmatrix}$ 1 Mark

$= \begin{pmatrix} 3-2 \\ 4+3 \end{pmatrix}$ 1 Mark

$\vec{a} - \vec{c} = \begin{pmatrix} 1 \\ 7 \end{pmatrix}$ 1 Mark

(b) Mid point $= \left( \frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right)$ 2 marks

for A(3, 8) & B(−9, 2)

$M\left( \frac{3 + (-9)}{2}, \frac{8+2}{2} \right)$ 0.5 marks

$M\left( -\frac{6}{2}, \frac{10}{2} \right)$ 0.5 marks.

$M(-3, 5)$. 1 marks

(c) $\vec{a} = \begin{pmatrix} k \\ -1 \end{pmatrix}$, $\vec{b} = \begin{pmatrix} 5k - 32 \\ 3x - 16 \end{pmatrix}$

If $\vec{a} = \vec{b}$

$\begin{pmatrix} k \\ -1 \end{pmatrix} = \begin{pmatrix} 5k - 32 \\ 3x - 16 \end{pmatrix}$ 1 Mark

$\Leftrightarrow$ $k = 5k - 32$, $-1 = 3x - 16$

for $k = 5k - 32$

$k - 5k = -32$

$-4k = -32$

$\frac{-4k}{-4} = \frac{-32}{-4}$

$\boxed{k = 8}$ 2 marks

for $-1 = 3x - 16 \Leftrightarrow 3x - 16 = -1$

$3x = -1 + 16$

$\frac{3x}{3} = \frac{15}{3}$

$\boxed{x = 5}$ 2 marks.