MARKING GUIDE OF ORDINARY LEVEL MATHEMATICS NATIONAL EXAMINATION 2020-2021

SECTION A: Answer all questions

1. $\dfrac{4r^2-t}{5} = \dfrac{4\times 3^2-1}{4} = \dfrac{4\times 9-1}{5} = \dfrac{36-1}{5} = \dfrac{35}{5} = 7$

2. Let x be the number

    $\dfrac{110+x}{3} = 4x$

    $110 + x = 12x$

    $12x - x = 110$

    $11x = 110$

    $x = \dfrac{110}{11}$

    $x = 10$

3. $g(x) = 2x^2 - 1$

    $y = 2x^2 - 1$

    $x = 2y^2 - 1$

    $x + 1 = 2y^2$

    $\dfrac{x+1}{2} = y^2$

    $y = \sqrt{\dfrac{x+1}{2}}$

    $Thus, g^{-1}(x) = \sqrt{\dfrac{x+1}{2}}$

4. $\dfrac{7+2x}{3} = \dfrac{7x+1}{4}$

    $4(7 + 2x) = 3(7x + 1)$

    $28 + 8x = 21x + 3$

    $8x - 21x = 3 - 28$

    $-13x = -25$

    $\dfrac{-13x}{-13} = \dfrac{-25}{-13}$

    $x = \dfrac{25}{13}$

5. $x° + 40° + 92° = 180°$

    $x° + 132° = 180°$

$$x° = 180° - 132°$$

$$x° = 48°$$

6. $\begin{cases} y - 1 = 2x & (1) \\ 3y - 4x = 13 & (2) \end{cases}$

$$y = 2x + 1$$

Replace the value of y in the equation (2)

$$3(2x + 1) - 4x = 13 \ (2)$$

$$6x + 3 - 4x = 13$$

$$2x + 3 = 13$$

$$2x = 13 - 3$$

$$2x = 10$$

$$x = \frac{10}{2}$$
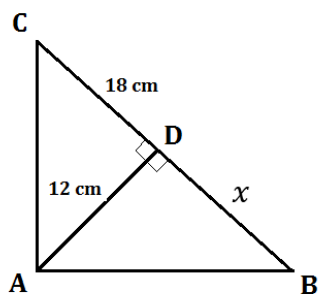
$$x = 5$$

Replace the value of x in the equation (1)

$$y - 1 = 2 \times 5$$

$$y = 10 + 1$$

$$y = 11$$

7. $\dfrac{\sqrt{5}}{\sqrt{15}+\sqrt{10}} = \dfrac{(\sqrt{5})(\sqrt{15}-\sqrt{10})}{(\sqrt{15}+\sqrt{10})(\sqrt{15}+\sqrt{10})} = \dfrac{(\sqrt{75}-\sqrt{50})}{15-10} = \dfrac{\sqrt{25\times3}-\sqrt{25\times2}}{5}$

$$= \frac{5\sqrt{3}-5\sqrt{2}}{5} = \frac{5(\sqrt{3}-\sqrt{2})}{5} = \sqrt{3} - \sqrt{2}$$

8.

$$\frac{AD}{DC} = \frac{BD}{AD}$$

$$AD^2 = DC \times BD$$

$$AD = \sqrt{DC \times BD}$$

$$12^2 = x \times 18$$

$$144 = 18x$$

$$x = \frac{144}{18}$$

$$x = 8cm$$

9. $\tan 39° = \frac{x}{18.6 \, cm}$

$$x = 18.6 \, cm \times \tan 39°$$

$$x = 15.1 \, cm$$

10. $\begin{pmatrix} x-8 \\ 2y+1 \end{pmatrix} = \begin{pmatrix} 0 \\ 0 \end{pmatrix}$

$$x - 8 = 0$$

$$\boldsymbol{x = 8}$$

$$2y + 1 = 0$$

$$2y = -1$$

$$\boldsymbol{y = -\frac{1}{2}}$$

11. $Mean = \frac{20+15+12+16+10}{5} = \frac{73}{5} = 14.6$

12. $\frac{y-y_1}{x-x_1} = \frac{y_2-y_1}{x_2-x_1}$

$$\frac{y-2}{x-1} = \frac{6-2}{-2-1}$$

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

$$-3(y - 2) = 4(x - 1)$$

$$-3y + 6 = 4x - 4$$

$$-3y = 4x - 4 - 6 - 3y = 4x - 10$$

$$y = -\frac{4}{3}x + \frac{10}{3}$$

13. $a^2 = (7 \times 9^1) + (1 \times 9^0) = 63 + 1 = 64$

$$a^2 = 64 = 8^2$$

$$a^2 = 8^2$$

$$a = 8$$

14. $\vec{u} = \begin{pmatrix} 2 \\ -3 \end{pmatrix}$ and $\vec{v} = \begin{pmatrix} -1 \\ 2 \end{pmatrix}$

$$-\vec{v} + 2\vec{u} = -\begin{pmatrix} -1 \\ 2 \end{pmatrix} + 2\begin{pmatrix} 2 \\ -3 \end{pmatrix} = \begin{pmatrix} 1 \\ -2 \end{pmatrix} + \begin{pmatrix} 4 \\ -6 \end{pmatrix} = \begin{pmatrix} 5 \\ -8 \end{pmatrix}$$

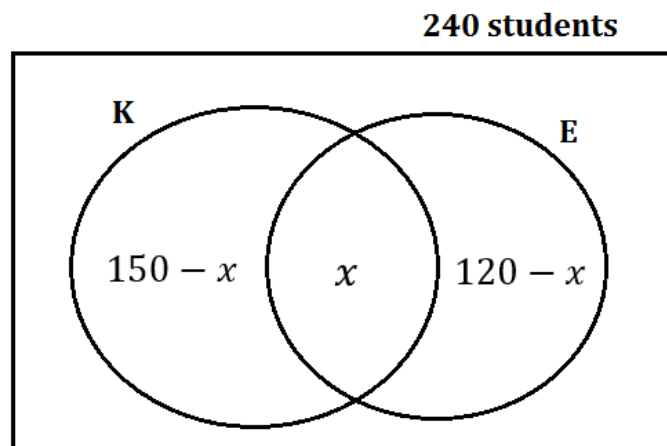15. (a) They are vertically opposite angles.

(b) $x - 10° = 125°$

$x = 125° + 10°$

$x = 135°$

SECTION B: Attempt only three questions (45 marks)

16. (a)

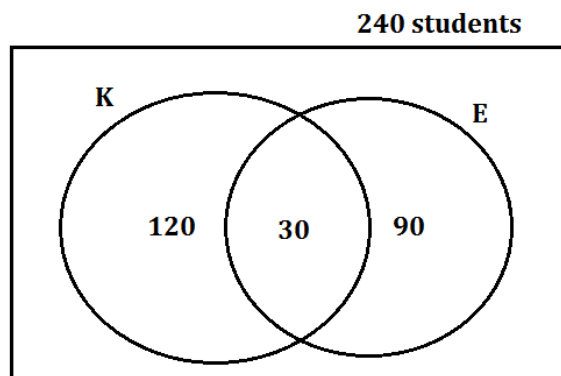**240 students**

$150 - x + x + 120 - x = 240$

$150 + 120 - x = 240$

$270 - x = 240$

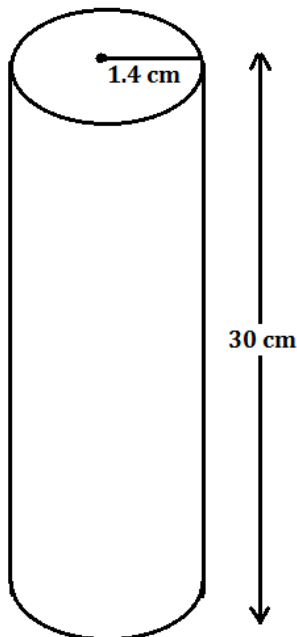$-x = 240 - 270$

$-x = -30$

$x = 30$

240 students

(i) Students who learn both languages = 30
(ii) Students who learn English only = 90
(iii) Students who learn Kinyarwanda = 120

(b)

$SB = \pi r^2 = \frac{22}{7} \times 1.4^2 = 6.16 \ cm^2$

$LS = 2\pi rh = 2 \times \frac{22}{7} \times 1.4 \times 30 = 264 \ cm^2$

$TS = 6.16 \ cm^2 + 264 \ cm^2 = 270.16 \ cm^2$

17. a) A(0,0); B(10,2) and C(2,6). $\vec{v} \begin{pmatrix} 2 \\ 3 \end{pmatrix}$

$A'(0+2, \ 0+3), B'(10+2, 2+3)$ and $C'(2+2, 6+3)$

$A'(2, \ 3), B'(12, 5)$ and $C'(4, 9)$

b) $31_x - 17_x = 16_x$

$3x + 1 - x - 7 = x + 6$

$3x - x - x = 6 + 7 - 1$

$x = 12$

18. a) $\frac{4}{7} = \frac{5}{x}$

$4x = 7 \times 5$

$x = \frac{7 \times 5}{4} = \frac{35}{4} = 8.75$

b) $\frac{4}{7} = \frac{6}{y+2}$ $4(y + 2) = 7 \times 6$
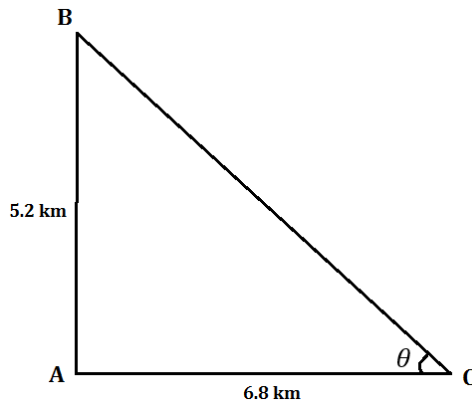
$4y + 8 = 42$

$4y = 42 - 8$

$4y = 34$

$$y = 8.5$$

c) $\overline{LK} = y + 2 = 8.5 + 2 = 10.5 \ cm$

d) $\overline{JK} = x = 8.5 \ cm$

19.

$$\overline{BC}^2 = \overline{AC}^2 + \overline{AB}^2 = (6.8)^2 + (5.2)^2 = 46.24 + 27.04 = 73.28 \ km^2$$

$$\overline{BC} = \sqrt{73.28km^2} = 8.56 \ km$$

b) $\tan \theta = \dfrac{5.2 \ km}{6.8 \ km} = 0.7647$

$$\theta = tan^{-1}(0.7647) = 37.4°$$

20. (a)

Height (in cm)	Midpoint, x	Frequency, f	fx	Cumulative frequency
150-154	152	5	760	5
155-159	157	2	314	7
160-164	162	6	972	13
165-169	167	8	1336	21
170-174	172	9	1548	30
175-179	177	11	1947	41
180-184	182	8	1092	47
185-189	187	3	561	50
		$\sum f = 50$	$\sum fx = 8530$	

(b) Mean $= \frac{\Sigma f_i x_i}{\Sigma f_i} = \frac{8530}{50} = 170.6 \; cm$

(c) The median class is the class whose cumulative frequency is the least cumulative frequency greater than $\frac{\Sigma f_i}{2} = \frac{50}{2} = 25$
The median class height is **170 – 174** with **cumulative frequency = 30.**

(d) The modal class is the class with the highest frequency. It is **175 - 179**