PRESIDENT'S OFFICE

REGIONAL ADMINITRATION AND LOCAL GOVERMENT

LONGIDO DISTRICT FORM THREE EXAMINATION

BASIC MATHEMATICS MARKING GUIDE.

01/18

Q11. Given (a) $X = 4.5 \times 10^{-7}$, $y = 7.2 \times 10^{5}$

$z = xy$

$z = (4.5 \times 10^{-7})(7.2 \times 10^{5})$

$= (4.5 \times 7.2) \times 10^{-7+5}$

$= 32.4 \times 10^{-2}$

$= 3.24 \times 10^{-2+1}$

$= 3.24 \times 10^{-1}$

(b) Let $x = 0.5\dot{1}\dot{6}$

$100x = 51.\dot{6}$

$100x - x = 51.\dot{6} - 0.5\dot{1}\dot{6}$

$99x = 51.1$

$x = \frac{51.1}{99}$

$x = \frac{511}{990}$

Q2. (a) $(\sqrt{3}+5)^2$

$= (\sqrt{3}+5)(\sqrt{3}+5)$

$= \sqrt{9} + 5\sqrt{3} + 5\sqrt{3} + 25$

$= 3 + 10\sqrt{3} + 25$

$= 28 + 10\sqrt{3}$

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2 (b) $\left(\frac{1}{81}\right)^{-6x} \times 81 = \sqrt{9}$

$\left(\left(\frac{1}{3}\right)^4\right)^{-6x} \times (3^4) = 3$

$(3^{-4})^{-6x} \cdot 3^4 = 3^1$

$24x + 4 = 1$

$24x = 1 - 4$

$\frac{24x}{24} = \frac{-3}{24}$

$x = \frac{-1}{8}$

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3. (a) Given

$\xi = \{x : x \text{ is an integer } 10 \leq x \leq 30\}$

i.e. $\{10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30\}$

$A = \{x : x \text{ is multiple of } 5\}$.

i.e $\{10, 15, 20, 25, 30\}$

$B = \{x : x \text{ is a prime number}\}$.

$= \{11, 13, 17, 19, 23, 29\}$

Required (i) $A' \cap B = \{11, 13, 17, 19, 23, 29\}$

(b). (ii) $n(A \cup B)'$

$(A \cup B) = \{10, 11, 13, 15, 17, 19, 20, 23, 25, 29, 30\}$

$(A \cup B)' = 12, 14, 16, 18, 21, 22, 24, 26, 27, 28$

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3. (b) Given $M = \frac{qE}{b+qc}$

Required a

$$\frac{M}{1} = \frac{qE}{b+qc}$$

$$qE = M(b+qc)$$

$$qE = Mb + Mqc$$

$$qE - Mqc = Mb.$$

$$q(E - Mc) = Mb.$$

$$q = \frac{Mb}{E - Mc}$$

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4. (a) Given

$$2\log_6^3 + \log_6^{12} + \log_6^8 - \log_6^{24}$$

$$= \log_6^{3^2} + \log_6^{12} + \log_6^8 - \log_6^{24}$$

$$= \log_6^9 + \log_6^{12} + \log_6^8 - \log_6^{24}$$

= By product law and quotient law.

$$= \log_6(9 \times 12 \times 8) - \log_6^{24}$$

$$= \log_6^{864} - \log_6^{24}$$

$$= \log_6\left(\frac{864}{24}\right)$$

$$= \log_6^{36}$$

$$= \log_6^{6^2}$$

$$= 2\log_6^6 \quad \text{but } \log_6^6 = 1$$

$$= 2 \times 1$$

$$= 2$$

(b). Given $\log 2 = 0.3010$ $\log 3 = 0.4771$ and $\log 5 = 0.6989$.

Required: $\log 7.5$

$$\log 7.5 = \log \frac{75}{10}$$

Then

$$\log 75 - \log 10$$

$$\log(5^2 \times 3) - \log 10$$

4. (b). $\log 5^2 + \log 3 - \log 10$.

$= 2\log 5 + \log 3 - \log 10$

$= 2 \times 0.6989 + 0.4771 - 1$

$= 1.3978 + 0.4771 - 1$

$= 1.8749 - 1$

$= 0.8749$

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5 (a) Given $P * K = PK + 2P - 3K$

Required

(i) $3 * 5$.

By relating with $P * K$, $P = 3$, $K = 5$.

Now $3 * 5 = 3 \times 5 + 2 \times 3 - 3 \times 5$

$= 15 + 6 - 15$

$= 6$

(ii) $5 * a = 20$

by relating from $P * K$

$P = 5$

$K = a$.

Now $P * K = PK + 2P - 3K$.

$5 * a = 5 \times a + 2 \times 5 - 3 \times a$ but $5 * a = 20$

$5 * a = 5a + 10 - 3a$

$20 = 5a + 10 - 3a$

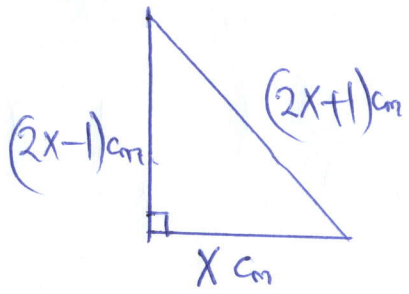
$20 = 2a + 10$

$20 - 10 = 2a$

$2a = 10$

$a = 5$

5. (b) Consider $\triangle$.



from P/ theorm.

$a^2 + b^2 = c^2$.

$$(x\,cm)^2 + ((2x-1)\,cm)^2 = ((2x+1)\,cm)^2$$

$$x\,cm^2 + (4x^2 - 4x + 1)\,cm^2 = (4x^2 + 4x + 1)\,cm^2$$

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

$$5x^2 - 4x + 1 = 4x^2 + 1 + 4x$$

$$5x^2 - 4x^2 - 4x - 4x + 1 - 1 = 0$$

$$x^2 - 8x = 0$$

$$x(x-8) = 0$$

$x = 0$ and $x = 8$ but $x \neq 0$ (distance).

Now, the value of x is 8.

6. (a). Angle of Interior + Angle of exterior = 180°

let exterior angle = X

Interior angle = 4X.

$4X + X = 180^\circ$

$5X = 180^\circ$

$X = 36^\circ$

Interior angle = 4X but X = 36.

$= 4 \times 36$

$= 144^\circ$

Now, form X° Interior $= \frac{(n-2)}{n} 180.$

$144^\circ = \left(\frac{n-2}{n}\right) 180^\circ$

$144^\circ = \frac{180n - 360^\circ}{n}$

$144^\circ n = 180n - 360^\circ$

$360^\circ = 180^\circ n - 144^\circ n$

$\frac{360^\circ}{36} = \frac{36n}{36}$

$n = 10.$

∴ The polygon has 10 sides

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6 (b). Given:

$A_3 = 4$

$A_9 = 21$

Required common difference and first term.

from $A_3 = A_1 + 2d$

$4 = A_1 + 2d$

$A_1 + 2d = 4$ ——— (i)

Also. $A_9 = A_1 + 8d$

$21 = A_1 + 8d$

$A_1 + 8d = 21$ ——— (ii)

By elimination method.

$$-\left|\begin{array}{l} A_1 + 2d = 4 \\ A_1 + 8d = 21 \end{array}\right.$$

$2d - 8d = 4 - 21$

$-6d = -17$

$d = \frac{17}{6}$.

from eqn (i).

$A_1 + 2d = 4$ but $d = \frac{17}{6}$

$A_1 + 2\left(\frac{17}{6}\right) = 4$

$A_1 + \frac{17}{3} = 4$

$A_1 = \frac{4}{1} - \frac{17}{3} = \frac{12 - 17}{3}$

$A_1 = -5/3$

∴ The first term and common difference is ~~$\frac{17}{6}$ and~~ $-5/3$ and $\frac{17}{6}$ respectively.

7 (a) 1 Litre ⟶ 600/=

? X 208,800/=

$$\frac{1 \text{ Litre} \times 208{,}800}{600} = 348 \text{ litres}.$$

(b). $y \propto \sqrt{x}$, $x = 4, y = 80$.

$y = k\sqrt{x}$

$$k = \frac{y}{\sqrt{x}} = \frac{80}{\sqrt{4}}$$

$$= \frac{80}{2}$$

$k = 40$

Required y when $x = 10$

Now. $y = k\sqrt{x}$.

$y = 40\sqrt{10}$

$\therefore$ $y = 40\sqrt{10}$

8. (a) $3x + y = 9$ —(i)

$x - 2y = 10$ —(ii)

by elimination method.

$$\begin{array}{l|l} 1 & 3x + y = 9 \\ 3 & x - 2y = 10 \end{array}$$

$$\begin{array}{l|l} - & 3x + y = 9 \\ & 3x - 6y = 30 \end{array}$$

$7y = -21$

from equation (ii)

$x - 2y = 10$ but $y = -3$

$x - 2(-3) = 10$

$x - (-6) = 10$

$x + 6 = 10$

$x = 10 - 6$

$x = 4$

8 (b). Area of a shaded region = Area of a square − Area of a quarte circle.

Area of a square = L×L
= 14cm × 14 cm.
= 196 cm²

Area of quarte circle = $\frac{1}{4}\pi r^2$
= $\frac{1}{4} \times \frac{22}{7} \times 14cm \times 14cm$.
= $\frac{1}{4} \times 44 \times 14 cm^2$
= $11 \times 14 cm^2$
= $154 cm^2$

Area of a shaded region = $196cm^2 - 154cm^2$
= $42 cm^2$.

9. (a). Given $4x^2 - 32x + 12 = 0$.

by quadratic formula.

$a = 4, b = -32 \quad c = 12$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$x = \frac{-(-32) \pm \sqrt{(-32)^2 - 4 \times 4 \times 12}}{2 \times 4}$$

$$= \frac{32 \pm \sqrt{1024 - 192}}{8}$$

$$= \frac{32 \pm \sqrt{832}}{8}$$

$$x = \frac{32 \pm \sqrt{832}}{8}$$

$$x = \frac{32 \pm 8\sqrt{13}}{8}$$

$$x = \frac{32 \pm 8\sqrt{13}}{8}$$

$$x = 4 \pm \sqrt{13}.$$

9. (b) Let x be Nice age

Mothers Age = x+6

$x(x+6) = 135$

$x^2 + 6x = 135$

$x^2 + 6x - 135 = 0.$

$x^2 + 15x - 9x - 135 = 0.$

$x(x+15) - 9(x+15) = 0$

$x - 9 = 0$

$x = 9$

$x + 15 = 0$

$x = 0 - 15$

$x = -15$

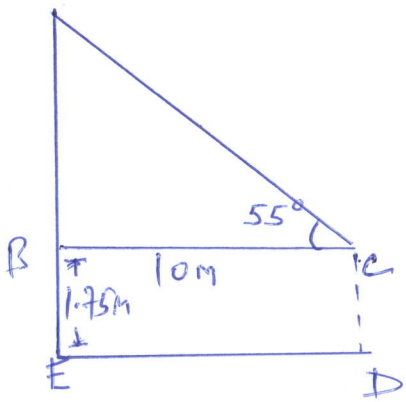
Since age cannot be negative, $x = 9$.

Now,

Nice age is 9

Mothers age is $9 + 6 = 15$ years

10. (a).



$\tan 55° = \frac{AB}{10}$, $AB = 10 \tan 55°$

The height of tree is

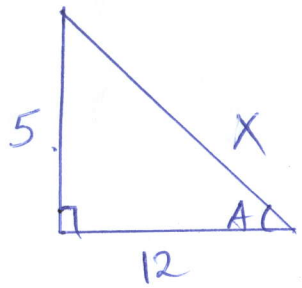
AB + BE

= 14.3M + 1.75M

= 16.05M

10. (b) $12\tan A = 5$

$\tan A = 5/12$.



$\sin A = 5/13$ $\quad \cos A = 12/13$ $\quad$ from $a^2 + b^2 = c^2$.

Now $X = 13$.

from $\dfrac{\sin A - 2\cos A}{\sin A}$

$$= \frac{5/13 - 2\left(\frac{12}{13}\right)}{5/13}$$

$$= \frac{5/13 - \frac{24}{13}}{5/13}$$

$5/13 - \frac{24}{13} = \dfrac{-19}{13}$

$$= \frac{-19}{13/5/13} = \frac{-19}{13} * 13/5 = \frac{-19}{5}.$$

$$\therefore \frac{\sin A - 2\cos A}{\sin A} = \frac{-19}{5}$$

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11. Given

$$f(x) = \begin{cases} 2x+1 & \text{if } x > 2 \\ -1 & \text{if } -2 < x \le 2 \\ x & \text{if } x \le -2 \end{cases}$$

but $f(x) = y$.

$y = 2x+1 \qquad x > 2.$

By table value.

x	2	3	4	----
y	5	7	9	

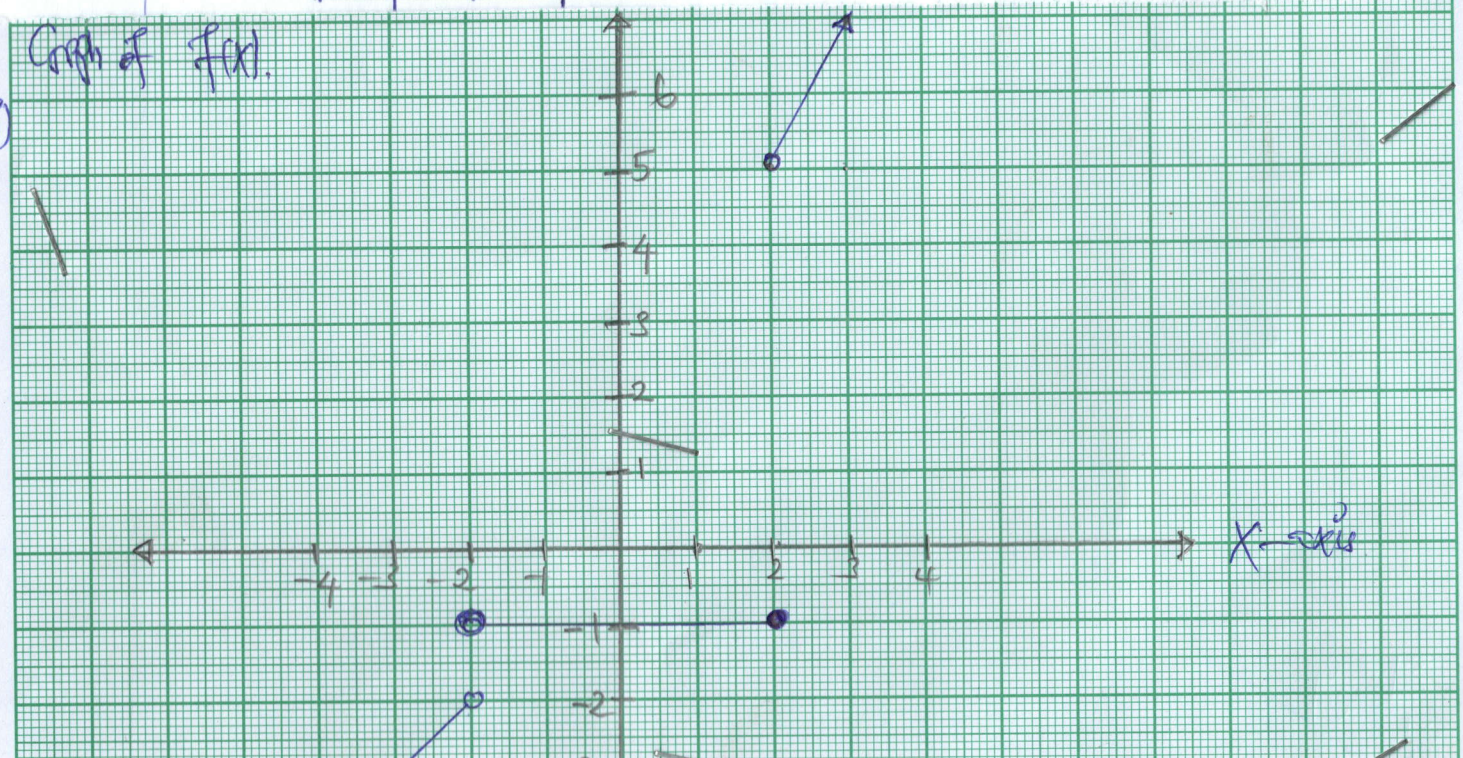
$y = -1 \qquad -2 < x \le 2.$

x	-2	-1	0	1	2
y	-1	-1	-1	-1	-1

$y = x. \qquad x \le -2.$

x	-2	-3	-4	----
y	-2	-3	-4	

Q11. (i)



11. (II) Domain = {x : x are all real numbers}

Range = {y : y ≤ −1 and y ≥ 5}

(III). $f(5) = 2x + 1$ but $x = 5$

$= 2 \times 5 + 1$

$= 11$

$f(5) = 11$

$f(10) = 2x + 1$ but $x = 10$

$= 2 \times 10 + 1$

$= 21$.

$f(-5) = x$ but $x = -5$

$f(-5) = -5$.

(IV) function is one to one.

12 (a) Modal class is 60-69.

(b). (i) Mode.

From $\text{Mode} = L + \left(\frac{t_1}{t_1+t_2}\right) i$

where $L = 59.5$

$t_1 = 16-14$
$= 2$

$t_2 = 16-8$
$= 8$

$i = 10.$

Then $\text{Mode} = 59.5 + \left(\frac{2}{2+8}\right) \times 10$

$= 59.5 + \frac{2}{10} \times 10$

$= 59.5 + 2$
$= 61.5$

$\therefore$ Mode is 61.5

(ii) Median

$\text{Median} = L + \left(\frac{\frac{N}{2} - nb}{nw}\right) \times i.$

where $L = 59.5$
$N = 68$
$nb = 32$
$nw = 16$
$i = 10.$

$\text{Median} = 59.5 + \left(\frac{68}{2} - 32\right) \times 10.$

$\text{Median} = 59.5 + \frac{2}{16} \times 10$

$= 59.5 + \frac{20}{16}$

$= 59.5 + 1.25$

$= 60.75$

$\therefore$ Median is 60.75

12. (c). The students failed test $= 6 + 12$
$= 18$ students.

13. $T \propto \frac{L}{M}$ where T = Time
L = Length
M = Men.

$T \propto \frac{L}{M}$, $T = K\frac{L}{M}$. but $M = 5$
$L = 50$
$t = 3$ hrs.

Then. $3 = K\left(\frac{50}{5}\right)$

$3 = K(10)$

$K = 3/10$.

Required t when $M = 4$, $L = 30$M.

Now, from

$T = K(L/M)$

$T = 3/10\left(\frac{30}{4}\right)$

$= 3/10 \times 30/4$

$= 3 \times 3/4$

$= 9/4$

$= 2.25$ hours.

$\therefore$ Time is 2.25 hours or 2 1/4 hours.

18 17

14. $A_4 \quad A_6 \quad A_9$
$\quad | \quad\quad | \quad\quad |$
$G_1 \quad G_2 \quad G_3.$

$A_4 = A_1 + 3d$
$A_6 = A_1 + 5d$
$A_9 = A_1 + 8d$

Now,

$G_1 = A_1 + 3d$ but $A_1 = 3$

$G_1 = 3 + 3d$ ——— (i)

$G_2 = A_1 + 5d$ but $A_1 = 3$.

$G_2 = 3 + 5d$ ——— (ii)

$G_3 = A_1 + 8d$ but $A_1 = 3$.

$=$

$G_3 = 3 + 8d$ ——— (iii)

from. Common ratio Concept.

$\frac{G_2}{G_1} = \frac{G_3}{G_2}$.

$\frac{(3+5d)}{(3+3d)} = \frac{(3+8d)}{(3+5d)}$

$(3+5d)(3+5d) = (3+3d)(3+8d)$

$9 + 15d + 15d + 25d^2 = 9 + 24d + 9d + 24d^2$

$30d + 25d^2 = 33d + 24d^2$

$30d - 33d = 24d^2 - 25d^2$

$-3d = -d^2 \qquad d = 3.$

From ~~EqA~~

Common ratio

$$\frac{G_2}{G_1} = \frac{3+5d}{3+3d} \quad \text{but } d=3$$

$$= \frac{3+5\times 3}{3+3\times 3}$$

$$= \frac{3+15}{3+9}$$

$$= \frac{18}{12}$$

$$= 3/2.$$

∴ The Common difference is 3 and Common ratio is $3/2$