

THIRD FORM MATHEMATICS

Internal Promotion Examination 2013

1] 6, 5, 11, 9, 8, 5, 8
 $\equiv 5, 5, 6, 8, 9, 11$

Median = 8 (B) ①

2] $3, \frac{1}{20}$ (C) ①

3]
$$\frac{(v \times t) + (w \times u)}{(v + w)}$$

$$= \frac{v(t + wu)}{(v + w)}$$
 (D) ①

4]
$$\frac{a^2b(a+b)}{ab}$$

$$= a(a+b)$$
 (C) ①

5]
$$(2x^3)^3$$

$$= (2)^3 (x^3)^3$$

$$= 8x^9$$
 (D) ①

6]
$$p = x - yz$$

$$yz = x - p$$

$$z = \frac{x - p}{y}$$
 (B) ①

7] $\{-2, -1, 0, 1, 2\}$
 1-1 M: $x \rightarrow 2x+1$ (A) ①

8] $p \propto \frac{1}{q} \rightarrow p = \frac{k}{q}$ (C) ①

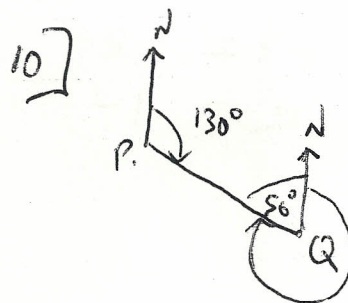
9]
$$3x + 2y = 6$$

$$+2y = -3x + 6$$

$$y = \frac{-3x + 6}{+2} = \frac{-3x}{+2} + \frac{6}{+2}$$

$$y = -\frac{3}{2}x + 3$$

$$\therefore m = -\frac{3}{2}$$
 (D) ①



$360^\circ - 50^\circ = 310^\circ$ (C) ①

$$11] \text{ Cost Price} = \$6000$$

$$(i) 8\% \times \$3000 \\ = \frac{8}{100} \times \$3000 \quad (1) \\ = \$240 \quad (1)$$

$$(ii) \text{ Cost after 1 year} \\ = \frac{92}{100} \times \$3000 \\ = \$2,760 \quad (1)$$

$$\text{Cost after 2 years} \\ = \frac{92}{100} \times \$2,760 \quad (1) \\ = \$2,539.20 \quad (1)$$

$$12] y \propto x^2 \\ \text{i.e. } y = kx^2 \quad (1)$$

$$(i) 3 = k(2^2) \quad (1) \\ \frac{3}{4} = k \quad (1)$$

$$(ii) y = \frac{3}{4} x^2$$

$$\text{when } x = 4$$

$$y = \frac{3}{4} (4^2) \quad (1)$$

$$y = \frac{3}{4} (16)$$

$$y = 12 \quad (1)$$

$$13] 4(x+2) \geq 3(x-1) + 1 \\ 4x + 8 \geq 3x - 3 + 1 \quad (1) + (1) \\ 4x + 8 \geq 3x - 2 \\ 4x - 3x \geq -2 - 8 \quad (1) + (1) \\ x \geq -10 \quad (1)$$

$$14] \begin{cases} 3x - 5y = 11 & (1) \\ 5x - y = 11 & (2) \times 5 \end{cases} (1)$$

$$\begin{array}{r} 3x - 5y = 11 \\ 25x - 5y = 55 \\ \hline -22x \quad \quad = -44 \\ x = 2 \end{array} \quad (1)$$

$$\text{Sub. into } (1)$$

$$3(2) - 5y = 11 \quad (1)$$

$$6 - 5y = 11$$

$$6 - 11 = 5y$$

$$-5 = 5y$$

$$-1 = y \quad (1)$$

15] (i) L (0, 2) (1) ✓
 M (3, 8) (1) ✓

(ii) $|LM| = \sqrt{(8-2)^2 + (3-0)^2}$ (1) ✓
 $= \sqrt{6^2 + 3^2}$
 $= \sqrt{36 + 9}$
 $= \sqrt{45}$
 $= 3\sqrt{5}$ UNITS

length of LM = 6.71 (3 sig. fig) (1) ✓

(iii) $P = \left(\frac{0+3}{2}, \frac{2+8}{2} \right)$ (1) + (1) ✓
 $= \left(\frac{3}{2}, 5 \right)$ (1) ✓

(iv) Gradient of LM

$= \frac{8-2}{3-0}$ (1) ✓

$= \frac{6}{3}$

$= 2$ (1) ✓

(v) Eqⁿ of Perpendicular bisector

$\frac{y-5}{x-\frac{3}{2}} = -\frac{1}{2}$ (1) + (1) ✓

$2y - 10 = -x + \frac{3}{2}$ (1) ✓

$2y + x = 10 + \frac{3}{2}$

$2y + x = \frac{23}{2}$

OR $4y + 2x = 23$ (1) ✓

OR $y = -\frac{1}{2}x + \frac{23}{4}$

16] (i) Total tax-free allowances

$$\begin{aligned} &= \$ 2000 \quad \textcircled{1} - \\ &+ \$ 300 \quad \textcircled{1} - \\ &+ \$ 500 \quad \textcircled{1} - \\ &+ \$ 900 \quad \textcircled{1} - \\ \hline &\$ 3700 \quad \textcircled{1} - \end{aligned}$$

(ii) Taxable Income

$$\begin{aligned} &= \$ 40000 - \$ 3700 \quad \textcircled{1} - \\ &= \$ 36300 \quad \textcircled{1} - \end{aligned}$$

(iii) $4\% \times \$ 36300$ $\textcircled{1} -$

$$= \frac{4}{100} \times \$ 36300$$

$$= \$ 1452 \quad \textcircled{1} -$$

17] (a) $V = l b h$

$$= 16\text{cm} \times 16\text{cm} \times 6\text{cm} \quad \textcircled{1} -$$

$$= 1536 \text{cm}^3 \quad \textcircled{1} -$$

17] (d) Volume of wood remaining

$$= 1536\text{cm}^3 - 770\text{cm}^3 \quad \textcircled{1} -$$

$$= 766 \text{cm}^3 \quad \textcircled{1} -$$

(b) Req'd Area

$$= (16\text{cm})^2 - \pi (7\text{cm})^2 \quad \textcircled{1} + \textcircled{1}$$

$$= 256\text{cm}^2 - 49 \times \frac{22}{7} \text{cm}^2$$

$$= 256\text{cm}^2 - 154\text{cm}^2$$

$$= 102 \text{cm}^2 \quad \textcircled{1} -$$

(c) Volume of cylinder

$$= \pi r^2 h$$

$$= \frac{22}{7} \times (7\text{cm})^2 \times 5\text{cm} \quad \textcircled{1} -$$

$$= 770 \text{cm}^3 \quad \textcircled{1} -$$

$$18] (a) s = \frac{8+8+8}{2}$$

$$s = 12 \text{ cm}$$

① -

Area of ΔAOB

$$= \sqrt{s(s-a)(s-b)(s-c)}$$

$$= \sqrt{12(12-8)(12-8)(12-8)} \text{ cm}^2 \quad \text{① -}$$

$$= \sqrt{12(4)(4)(4)} \text{ cm}^2$$

$$= \sqrt{768} \text{ cm}^2$$

$$= 27.7 \text{ cm}^2$$

① -

(b)(i) Area of sector AOB

$$= \frac{60^\circ}{360^\circ} \times \pi r^2$$

① -

$$= \frac{1}{6} \times 3.142 \times (8 \text{ cm})^2$$

$$= 33.5 \text{ cm}^2$$

① -

(ii) Area of segment AB

$$= 33.5 \text{ cm}^2 - 27.7 \text{ cm}^2 \quad \text{① -}$$

$$= 5.8 \text{ cm}^2$$

① -

$$19] (i) \text{ Range } 159.5 - 139.5 \quad \text{① -}$$

$$= 20 \text{ cm} \quad \text{① -}$$

$$19] (iv) P(x \geq 149.5 \text{ cm})$$

$$= \frac{12+6}{40} \quad \text{① -}$$

$$= \frac{9}{20}$$

① -

(ii) Modal Class $(145-149) \text{ cm}$ ① -

(iii) Mean Height, \bar{x}

$$= \frac{(142 \times 5) + (147 \times 17) + (152 \times 12) + (157 \times 6)}{(5 + 17 + 12 + 6)}$$

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$$(5 + 17 + 12 + 6)$$

①

$$= \frac{5975}{40}$$

$$= 149.4 \text{ cm (1 d.p.)}$$

①

$$20] \quad (i) \quad \sin 15^\circ = \frac{BG}{8.4m} \quad \textcircled{1} -$$

$$\sin 15^\circ \times 8.4m = BG \quad \textcircled{1} -$$

$$2.17m = BG \quad \textcircled{1} -$$

$$(ii) \quad \cos \hat{C}BG = \frac{BG}{12.6m} \quad \textcircled{1}$$

$$\cos \hat{C}BG = \frac{2.17}{12.6}$$

$$\hat{C}BG = \cos^{-1} \left(\frac{2.17}{12.6} \right) \quad \textcircled{1}$$

$$= 80.1^\circ \quad \textcircled{1}$$

$$(iii) \quad 8.4^2 = 2.17^2 + (AG)^2 \quad \textcircled{1} \quad \text{OR} \quad \cos 15^\circ = \frac{AG}{8.4m}$$

$$8.4^2 - 2.17^2 = (AG)^2$$

$$\sqrt{8.4^2 - 2.17^2} = (AG) \quad \textcircled{1}$$

$$8.1149m = AG$$

$$\cos 15^\circ \times 8.4m = AG$$

$$8.1138m = AG$$

$$12.6^2 = 2.17^2 + (GC)^2 \quad \textcircled{1} -$$

$$12.6^2 - 2.17^2 = (GC)^2$$

$$\sqrt{12.6^2 - 2.17^2} = GC \quad \textcircled{1}$$

$$12.4117m = GC$$

$$\sin 80.1^\circ = \frac{GC}{12.6m}$$

$$\sin 80.1^\circ \times 12.6m = GC$$

$$12.4124m = GC$$

$$\therefore AC = AG + GC$$

$$= 8.1138m + 12.4124m$$

$$AC = 20.5m$$

$$\therefore AC = AG + GC$$

$$= 8.1149m + 12.4117m$$

$$AC = 20.5m \quad \textcircled{1} -$$