Solutions and Marking Key – Third Form Mathematics Promotion Examination 2015 – 2016

1) (B) **2) (A)** **3) (D)** **4) (C)** **5) (D)**

6) (D) **7) (B)** **8) (A)** **9) (C)** **10) (B)** **[10]**

11) P = \$ 60 000, R = 7.5 %

(i) $\frac{7.5}{100} \times$ \$ 60 000 = \$ 4 500 **[1]**

OR \$ 60 000 – ($\frac{92.5}{100} \times$ \$ 60 000) = \$ 4 500 **[1]**

(ii) Value = $P\,(1 - \frac{R}{100})^n$

= 60 000 $(1 - \frac{7.5}{100})^3$ **[1 + 1]**

= \$ 47 487.19 **[1] cao**

OR After 1 year = \$ 55 500 **[1]**

After 2 years = \$ 55 500 × 0.925

= \$ 51 337.50 **[1]**

After 3 years = \$ 51 337.50 × 0.925

= \$ 47 487.19 **[1] cao**

12) (i) $s \;\alpha\; \frac{1}{t^2} \rightarrow s = \frac{k}{t^2}$ **[1]**

$s = 10, t = 2 \rightarrow 10 = \frac{k}{2^2}$

$40 = k$ **[1]**

(ii) $s = \frac{40}{t^2}$ **[1]**

$t = 8$: $s = \frac{40}{8^2}$

$s = \frac{5}{8}$ **[1] cao**

13) (i) $(r - \frac{1}{4}) \geq \frac{1}{3}(r + 1)$

$12(r - \frac{1}{4}) \geq 12[\frac{1}{3}(r + 1)]$ **[1]**

$12r - 3 \geq 4(r + 1)$ **[1]**

$12r - 3 \geq 4r + 4$ **[1]**

$8r \geq 7$ **[1]**

$r \geq \frac{7}{8}$ **[1] cao**

OR $(r - \frac{1}{4}) \geq \frac{1}{3}(r + 1)$

$r - \frac{1}{4} \geq \frac{1}{3}r + \frac{1}{3}$ **[1]**

$r - \frac{1}{3}r \geq \frac{1}{3} + \frac{1}{4}$ **[1+1]**

$\frac{2}{3}r \geq \frac{4+3}{12}$

$\frac{2}{3}r \geq \frac{7}{12}$ **[1]**

$r \geq \frac{7}{8}$ **[1] cao**

(ii) $r \geq \frac{7}{8}$, $r \in \boldsymbol{Z}$

$\therefore r = 1$ **[1]**

14) $3x = 10 + 5y \quad Eqn\ (1)$
$5x - 3y = 6 \quad Eqn\ (2)$

From (1) $x = \frac{10+5y}{3}$ **[1]**

Sub. into (2): $5(\frac{10+5y}{3}) - 3y = 6$ **[1]**

$5(10 + 5y) - 9y = 18$

$50 + 25y - 9y = 18$ **[1]**

$16y = -32$

$y = -2$ **[1] cao**

Sub. into $x = \frac{10+5y}{3}$

$= \frac{10+5(-2)}{3}$ **[1]**

$= 0$ **[1] cao**

OR

$3x = 10 + 5y \quad Eqn\ (1) \times 5$
$5x - 3y = 6 \quad Eqn\ (2) \times (-3)$

$15x - 25y = 50$ **[1]**
$-15x + 9y = -18$ **[1]**

$-16y = 32$ **[1]**

$y = -2$ **[1]**

Sub. into Eqn (1)

$3x = 10 + 5(-2)$ **[1]**

$x = 0$ **[1] cao**

15) (i) Midpoint of line $\boldsymbol{L} = (\frac{0+3}{2}, \frac{2+8}{2})$ **[1]**

$= = (\frac{3}{2}, 5)$ **[1]**

(ii) Gradient of Line $\boldsymbol{L} = \frac{8-2}{3-0}$ **[1]**

$= 2$ **[1]** FOR $\frac{3-0}{8-2} = \frac{1}{2}$ give **1** mark

(iii) $\frac{y-2}{x-0} = \frac{2}{1}$ **[1]**

$y - 2 = 2x$

or $y = 2x + 2$ **[1] cao**

OR $\frac{y-8}{x-3} = \frac{2}{1}$ **[1]**

$y - 8 = 2x - 6$

i.e. $y = 2x + 2$ **[1] cao**

OR $y = mx + c$

$8 = 2(3) + c$

$2 = c$ **[1]**

$y = 2x + 2$ **[1] cao**

(iv) Gradient of perpendicular bisector of $\boldsymbol{L} = -\frac{1}{2}$ **[1]**

$\frac{y-5}{x-\frac{3}{2}} = -\frac{1}{2}$ **[1]**

$2y - 10 = -x + \frac{3}{2}$ **[1]**

$2y + x = \frac{23}{2}$ **[1]**

16) (i) Total Tax-Free Allowance = \$ 12 000 **[1]**

\+ \$ 08 000 **[1]**

\+ \$ (500 × 2) **[1]**

\$ 21 0000 **[1] cao**

(ii) Taxable Income = \$ 28 500 – \$ 21 000 **[1]**

= \$ 7 500 **[1] cao**

(iii) Income Tax Paid = $(\frac{4}{100} \times \$2\,000) + (\frac{6}{100} \times \$3\,000) + (\frac{8}{100} \times \$2\,500)$ **[1 + 1 + 1]**

= \$ 80 + \$ 180 + \$ 200

= \$ 460 **[1] cao**

(iv) Net Income = \$ 28 500 – \$ 460 **[1]**

= \$ 28 040 **[1] cao**

17) (i) Class limits of least common class are 340 and 344. **[1 + 1]**

(ii) Class boundaries of most common class are 344.5 and 349.5. **[1 + 1]**

(iii) P (x is at least 354.5 g) = $\frac{24 + 18}{110}$ **[1]**

$= \frac{21}{55}$ **[1]**

18) (a) $\cos 50^0 = \frac{OA}{9cm}$ **[1]** OR $\sin 40^0 = \frac{OA}{9cm}$ **[1]**

$\cos 50^0 \times 9\ cm = OA$ **[1]** OR $\sin 40^0 \times 9\ cm = OA$ **[1]**

$5.79\ cm = OA$ **[1]** OR $5.79\ cm = OA$ **[1]**

(b) (i) Area of sector $POQR = \frac{100}{360} \times \pi r^2$

$= \frac{5}{18} \times \frac{22}{7} \times (9\ cm)^2$ **[1]**

$= \frac{8910}{126}\ cm^2$

$= \frac{495}{7}$ or $70.7\ cm^2$ **[1]**

(ii) Now $\cos 40^0 = \frac{AQ}{9cm}$ **[1]**

$6.8944\ cm = AQ$ **[1]**

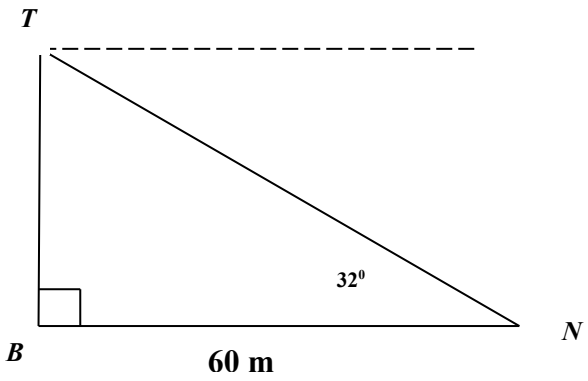
So, Area of triangle $POQ = [\frac{1}{2} \times 6.8944\ cm \times 5.79\ cm) \times 2]$

$= 39.9\ cm^2$ **[1]**

(iii) Area of shaded segment $PQR = 70.7\ cm^2 - 39.9\ cm^2$ **[1]**

$= 30.8\ cm^2$ (3 s.f.) **[1]**

19) (i)



[1] mark for each correct label × 5

(ii) $\tan 32^0 = \frac{TB}{60\ m}$ **[1]**

$\tan 32^0 \times 60\ m = TB$ **[1]**

$= 37.5\ m$ **cao** **[1]**

20)

(i) 3	$\frac{3}{2} + \left(\frac{2}{3} \times 3\right)$	$\frac{7}{2}$
(ii) 6	$3 + \left(\frac{2}{3} \times 6\right)$	7
(iii) 9	$\frac{9}{2} + \left(\frac{2}{3} \times 9\right)$	$\frac{21}{2}$
(iv) 39	b) $\frac{39}{2} + \left(\frac{2}{3} \times 39\right)$ [1]	c) $\frac{91}{2}$ [1]
(v) x	b) $\frac{x}{2} + \left(\frac{2}{3} \times x\right)$ [1]	c) $\frac{7x}{6}$ [1]