Answers to Year 11 "new topics" (revised)

1) $x^2+y^2=25$ (A)

$y=3x+13$ (B)

Subst (B) in A

$x^2+(3x+13)^2=25$

$x^2+9x^2+78x+169=25$

$10x^2+78x+144=0$

$10x^2+30x+48x+144=0$

$10x(x+3)+48(x+3)=0$

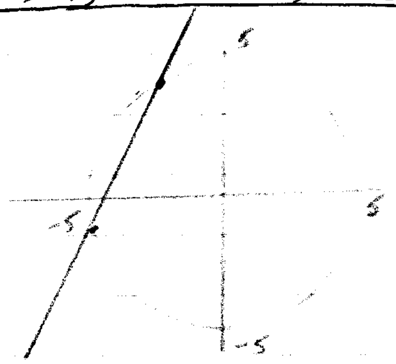
$(x+3)(10x+48)=0$

$\therefore$ $\underline{x=-3}$ or $\underline{x=-4\cdot8}$

So $y=-3\times3+13$ OR $y=3\times(-4\cdot8)+13$

$\underline{y=4}$ or $\underline{y=-1\cdot4}$

Line $y=3x+13$ intersects circle $x^2+y^2=25$ at $\underline{(-3,4)}$ & $\underline{(-4\cdot8,-1\cdot4)}$.



3) $y=x-4$ (A) $x^2+y^2=8$ (B)

Subst for y in B

$x^2+(x-4)^2=8$

$x^2+x^2-8x+16=8.$

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

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

$(x-2)(x-2)=0$

$(x-2)^2=0.$

$x=2$ is the only solution

$\therefore$ $\underline{y=x-4 \text{ is a tangent}}$.

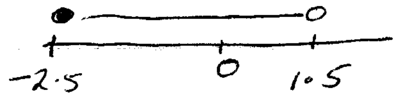
4) $5<8-2x\le13$

$5<8-2x$ $\quad$ $8-2x\le13$

$2x<3$ $\quad$ $-5\le2x$

$x<1\cdot5$ $\quad$ $-2\cdot5\le x$

$\underline{-2\cdot5\le x<1\cdot5}$



5) $y=4x+6$

Gradient is 4

Gradient of line $\perp^r$ is $-\frac{1}{4}$

$\therefore$ New line has equation

$y=-\frac{1}{4}x+c$

Passes thro' $(4,3)$

$\therefore$ $3=-\frac{1}{4}\times4+c$

$3=-1+c$

$c=4$

$\therefore$ Equ^n is

$\underline{y=\frac{-1}{4}x+4}$

or $\underline{4y=16-x}$

6) $\frac{32}{\sqrt8}=\frac{32\sqrt8}{\sqrt8\times\sqrt8}$

$=\frac{32\sqrt8}{8}$

$=4\times2\sqrt2$

$=\underline{8\sqrt2}$

7) $x=1\cdot\dot{0}3\dot{9}$

$1000x=1039\cdot\dot{0}3\dot{9}$

$\therefore 999x=1038$

$x=\underline{\frac{1038}{999}}$

8)

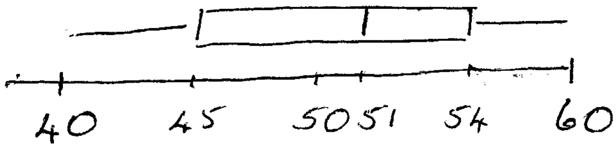
40-44	1, 4, 0, 4, 3
45-49	7, 5, 7, 8, 5, 9
50-54	4, 2, 1, 4, 3, 1, 4, 1
54-59	9, 8, 6
60-64	0

4	0, 1, 3, 4, 4
4	5 5, 7, 7, 8, 9
5	1 1, 1, 2, 3, 4 4, 4
5	6, 8, 9
6	0

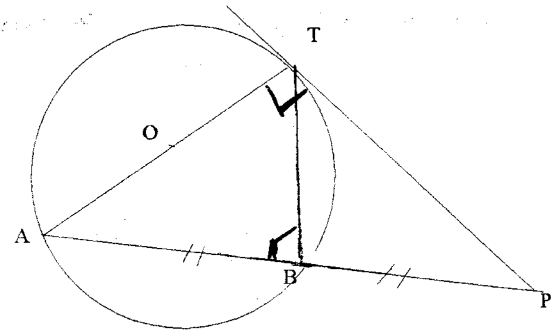
Key $5|2 = 52$ kg

Median @ $\frac{23+1}{2}$ place = 12th place

∴ Median = 51 ; L.Q = 45 UQ - 54



8)



$A\hat{T}P = 90^\circ$ (∠ between radius & tangent)

$A\hat{B}T = 90^\circ$ (∠ in a semicircle)

Show that $\triangle ATB$ is congruent to $\triangle PTB$

1) $A\hat{B}T = T\hat{B}P = 90^\circ$ (∠ on str line)

2) TB is common

3) AB = PB (given)

∴ $\triangle ATB \equiv \triangle PTB$ (SAS)

∴ AT = TP

& ∴ $\triangle ATP$ is isosceles

[* Not RHS even tho' there is a right angle]

$T\hat{A}P = B\hat{T}P$ (alternate segment)

& $T\hat{A}P = T\hat{P}A$

∴ $B\hat{T}P = T\hat{P}A$

but $T\hat{B}P = 90^\circ$ ∴ $\underline{B\hat{T}P} = \frac{90}{2} = \underline{45^\circ}$ (ω5)