ANSWER KEY FOR 2016

SECTION A

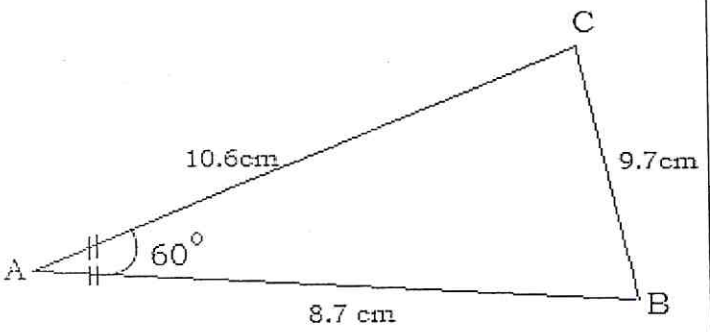
1) $\frac{0.085 \times 0.0084}{1.7 \times 0.007} = \frac{85 \times 10^{-3} \times 84 \times 10^{-4}}{17 \times 10^{-1} \times 7 \times 10^{-3}}$

$= 5 \times 12 \times 10^{-3} = 6 \times 10^{-2}$

2. a) 1st term = 1, 2nd term = 1 + 1 = 2,
3rd term = 2 + 2 = 4, 4th term = 4 + 3 = 7,
5th term = 7 + 4 = **11**, 6th term = 11 + 5 = **16**

b) 7th term = 16 + 6 = 22, 8th term = 22 + 7 = 29,
9th term = 29 + 8 = 37, 10th term = 37 + 9 = **46**

3. Sketch



4. a) $f\left(-\frac{1}{4}\right) = \frac{\frac{1}{4}+4}{-\left(\frac{1}{4}\right)+4} = \frac{-1+16}{4} = \frac{\frac{15}{4}}{\frac{17}{4}}$

$= \frac{15}{4} \times \frac{4}{17} = \frac{15}{17}$

b) f(x) is not defined for $-x + 4 = 0$

i.e. $x = 4$

5. $\frac{x+1}{2} - \frac{x-7}{3} = \frac{x}{3}$

$\frac{3x+3-2x+14}{6} = \frac{x}{3} = x + 17 = 2x$

$x - 2x = -17$
$x = 17$

6. $x^2 - x - 90 = 0$

$x^2 + 9x - 10x - 90 = 0$

$x(x + 9) - 10(x + 9) = 0$

$(x + 9) - (x + 10) = 0$

$x = -9$ *or* $x = 10$

7. Line B passes through (4,5 and (1, -4)

So gradient of B = $\frac{-4-5}{1-4} = \frac{-9}{-3} = 3$

A//B have the same gradient.

A = y + 1 = (3(x – 0)

y = 3x - 1

8. $m = kt^3$: $k = \frac{m}{t^3}$ and $t = \sqrt[3]{\frac{m}{R}}$

If m = 8, t = 4 $\Longrightarrow k = \frac{8}{4^3} = \frac{1}{8}$

For m = 27, $t = \sqrt[3]{27 \times 8}$; t = 6.

9. $\overrightarrow{MN} = \begin{pmatrix} 1+7 \\ -10+6 \end{pmatrix} = \begin{pmatrix} 8 \\ -4 \end{pmatrix}$

$\overrightarrow{MN} = k\overrightarrow{NO}$; $\overrightarrow{NO} = \begin{pmatrix} 3-1 \\ -4+10 \end{pmatrix} = \begin{pmatrix} 2 \\ -1 \end{pmatrix}$

$\begin{pmatrix} 8 \\ -4 \end{pmatrix} = 4\begin{pmatrix} 2 \\ 1 \end{pmatrix}$

10. gf(x) = 0;

g(2x + 1) = 0

$(2x + 1)^2 - 9 = 0$

$(2x + 1 + 3)(2x + 1 - 3) = 0$

$2x + 4 = 0$ *or* $2x - 2 = 0$

$x = -2$ *or* $x = 1$

11. Let 2 be the shortest side, the longest side is 2x, the third side is 2x – 7

$x + 2x + 2x - 7 = 78$

$5x = 7 + 78$

$x = 17$

The shortest side = 17 cm.

The longest side = 34 cm

The 3rd side = 27cm

12. Total amount = 6000 + 5000 + 4000+ 3000

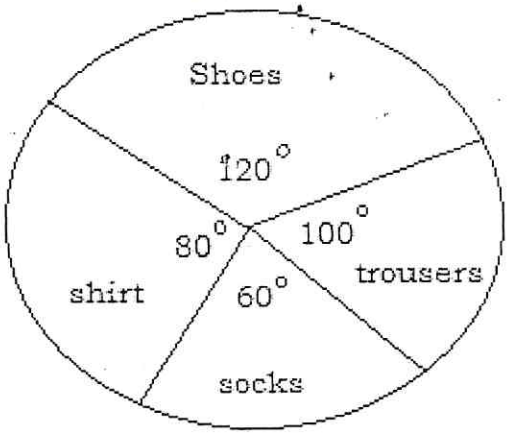
= 18,000

Then 18,000 ⟶ 360°

So, 6000 ⟶ 20° × 60 = 120°

5000 ⟶ 20° × 5 = 100°

4000 ⟶ 20° × 3 = 60°



13. $\frac{5}{\sqrt{5}} + \sqrt{20} = 5\sqrt{\frac{5}{5}}$, $2\sqrt{5} = 3\sqrt{5}$

Then $3\sqrt{5} = a\sqrt{5}$

a = 3

14. a//b ⇔ 7r = 4(21)

7r = 84

r = 12

15. Angle of rotation is 112° + 68° = 180°

The single rotation is < +180

SECTION B:

16. a) 40 hrs ⟶ 120,000Frw

For 2 supplementary hours = $\frac{120{,}000 \times 10}{100}$

= 12,000Frws.

For 1 hr; $\frac{12{,}000}{2}$ = 6000 Frw.

Surplus salary; 216,000 – 120,000 = 96,000Frw

Supplementary hours = $\frac{96{,}000}{6000}$ = 16 hrs.

b) i) = (25 × 12,400) + 15,000 = 325,000 Frw

ii) = Difference = 325000 – 257,000 = 68,000

c) Total amount after n years;

$P(1 - \frac{r}{100})^n$

P = 33,000,000; r = 15; n = 3

$33{,}000{,}000\ (1 - \frac{15}{100})^3$

33,000,000 × 0.614125

20,266,125 Frw

17. a) $\overline{OB} = \overline{OC}$ (Radii circle)

$\overline{AB} = \overline{AC}$ (Tangent from A)

OA is common

b) i) AOB = 180° - (90° + 40°) = 50°

ii) CAO = 180° - (90° + 50°) = 40°

c) $\overline{AO}$ = 13cm; $\overline{OC}$ = 5cm.

i) $\overline{AC} = \sqrt{13^2 - 5^2} = \sqrt{144} = 12$cm

Area of $\overset{\triangle}{}$ ACO = $\frac{\overline{AC} \times OC}{2}$ = 30cm²

ii) Shaded region: 360° - 100° = 260°

Area = $\frac{\theta}{360} \times \pi r^2 = \frac{260}{360} \times 3.14 \times 25$

= 56.694cm²; 56.7cm²

18. a) $\vec{a} = \begin{pmatrix}3\\4\end{pmatrix}$; $\vec{b}\begin{pmatrix}-12\\6\end{pmatrix}$

$2\vec{a} - 0.5\vec{b} = 2\begin{pmatrix}3\\4\end{pmatrix} - 0.5\begin{pmatrix}-12\\6\end{pmatrix}$

$= \begin{pmatrix}6\\8\end{pmatrix} - \begin{pmatrix}-6\\8\end{pmatrix} = \begin{pmatrix}12\\5\end{pmatrix}$

b) i) $\overrightarrow{ab} = \begin{pmatrix}2+3\\-3-2\end{pmatrix} = \begin{pmatrix}5\\-5\end{pmatrix}$

$\overrightarrow{bc} = \begin{pmatrix}6-2\\1+3\end{pmatrix} = \begin{pmatrix}4\\4\end{pmatrix}$

$\overrightarrow{ac}\begin{pmatrix}6+3\\1-2\end{pmatrix} = \begin{pmatrix}9\\-1\end{pmatrix}$

ii) $//\overrightarrow{ab}// = \sqrt{5^2 + (5)^2} = \sqrt{50}$

$//\overrightarrow{bc}// = \sqrt{4^2 + 4^2} = \sqrt{32}$

$//\overrightarrow{ac}// = \sqrt{9^2 + (-1)^2} = \sqrt{82}$

iii) Triangle abc is right angled at b if

$(\sqrt{50})^2 + (\sqrt{32})^2 = (\sqrt{82})^2$

$50 + 32 = 82.$

19. i) $p(x) = 6x^3 + 35x^2 + 19x - 30$

$= p(-5) = 6(-5)^3 + 35(-5)^2 + 19(-5) - 30$

$= 6(-125) + 35 \times 25 - 95 - 30$

$= -750 + 875 - 125$

$= -875 + 875$

$= 0$

-5 is a zero of p(x) and x + 5 is a factor of p(x)

	6	35	19	-30
-5		-30	-25	30
	6	5	6	0

$p(x) = (x + 5)(6x^2 + 5x - 6)$

$= (x + 5)(6x^2 + 9x - 4x - 6)$

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

$= (x + 5)(2x + 3)(3x - 2)$

ii) $p(x) = 0;\ x = -5\ or\ x = -\frac{3}{2}\ or\ x = \frac{2}{3}$

b) $\frac{x+2}{x-2} + \frac{x-2}{x+2} + \frac{8-4x}{x^2-4} = \frac{(x+2)^2+(x-2)^2}{x^2-4} = \frac{8-4x}{x^2-4}$

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

$2x^2 + 4x = 0$

$2x(x + 2) = 0$

$x = 0\ or\ x = -2\ (neglect)$

$x = 0$

20.a)

xi	fi	xifi
26	4	104
27	1	27
29	3	87
31	3	93
32	6	192
34	3	102
35	5	175
39	7	273
	32	1053

Mean time: $\frac{1053}{32} = 32.9 \simeq 33$

b) i) $\frac{15}{100} \times 3\text{hrs} = 27$ minutes

ii) $\frac{27}{32} \times 100 = 84.375\%$

c) i) 7 students

ii) 4 students

END