

# 2019 REVISION KIT

# ATIKASCHOOL.ORG

**Section 1 (50 mks)**

**Answer all questions in this section in the spaces provided.**

1. Use logarithms correct to 4 significant figures to evaluate. (4 mks)  

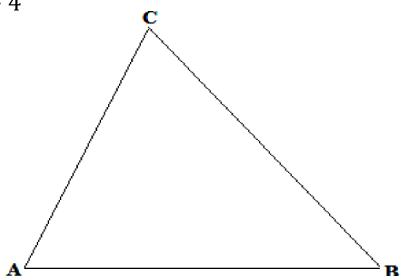
$$\frac{(93.4)^2 \times \sqrt{0.00435}}{\log 6.56}$$
2. Rono invested a sum of money, sh p at 24% p.a simple interest for 8 years and realised that he got the same amount as Wekesa who invested sh. 2p for 4 years at compound interest. Calculate the rate of interest p.a Wekesa enjoyed. (3 mks)
3. The position vectors of A and B are  $\vec{a} = 2i - 3j + 4k$  and  $\vec{b} = -2i - j + 2k$  respectively. Find to 2d.p the length of vector AB. (2 mks)
4. Make **p** the subject of the formula;  

$$L = \frac{2}{3} \sqrt{\frac{x^2 - Pt}{y}}$$
(3 mks)
5. Two taps A and B together, can fill water in a tank in 6 minutes. Tap A alone takes 5 minutes longer to fill the tank than the tap B alone. How many minutes does it take tap B alone to fill the tank. (3 mks)
6. Solve for x in the equation. (3 mks)  

$$2^{2x-1} + 4^{x+2} = 264$$
7. Find the radius and co-ordinates of the centre of a circle whose equation is (3 mks)  

$$\frac{1}{2}x^2 + \frac{1}{2}y^2 - 3x + 4y + \frac{6^3}{8} = 0$$
8. Find the equation of the tangent at the point (3, 1) to the curve. (3 mks)  

$$y = x^2 - 4x + 4$$
9. 



On the figure, find the locus of point P such that P is

  - i) nearer to A than B.
  - ii) Less than 5cm from B.
  - iii) nearer to AB than to AC.

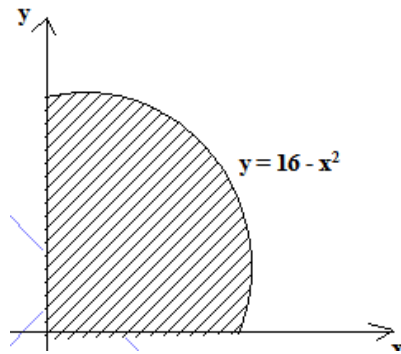
(3 mks)

(Shade the unwanted region.)
10. Ketepa tea worth ksh. 40 per kg is mixed with Sasini tea worth sh. 60 per kg in the ratio 3:1. In what ratio should this mixture be mixed with Kericho tea worth sh. 50 per kg to produce a mixture worth sh. 47 per kg. (3 mks)
11. Solve for x in the equation (4 mks)  

$$6\sin^2 x - \cos x - 5 = 0 \quad \text{for } 0 \leq x \leq 360^\circ.$$
12. If  $\frac{\sqrt{14}}{\sqrt{7}-\sqrt{2}} - \frac{\sqrt{14}}{\sqrt{7}+\sqrt{2}} = a\sqrt{7} + b\sqrt{2}$  (3 mks)  
 Find the values of a and b where a and b are rational numbers.
13. Expand  $(2 + \frac{1}{4}x)^6$  up to the term containing  $x^4$ . Hence evaluate  $(1.975)^6$  to 5 d.p. (4 mks)
14. A quantity **y** varies partly as **x** and partly as the inverse of the square of x. If x = 2 when y = 4 and x = 4 when y = 6.25 find the equation connecting **x** and **y**. (3 mks)
15. The eleventh term of an A.P is four times the second term. If the sum of the first seven terms of the A.P is 175 find the first term and the common difference. (3 mks)

16. Find the exact area of the shaded region.

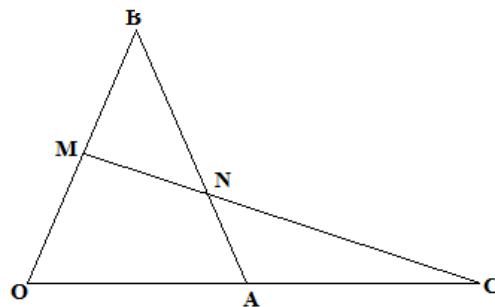
(3 mks)



**Section II (50 marks)**

**Answer any five questions from this section**

17. In the triangle OAB below,  $\vec{OA} = \underline{a}$ ,  $\vec{OB} = \underline{b}$  and  $\vec{OC} = \frac{3}{2}\vec{OA}$ . M divided OB in the ratio 3:2.



a) Express in terms of  $\underline{a}$  and  $\underline{b}$  only, the vectors

i)  $\vec{BA}$

(1 mk)

ii)  $\vec{MC}$

(1 mk)

b) Given further that  $MN = h\vec{MC}$  and  $BN = k\vec{BA}$ , express vector  $MN$  in two different ways and hence, find the value of  $h$  and  $k$ .

(6 mks)

c) Show that the points  $M$ ,  $N$  and  $C$  are collinear.

(2 mks)

18. In a botanical experiment, the length of 60 leaves of a certain type of a tree were measured correct to the nearest 0.1cm.

Length (cm)	3.0 - 3.4	3.5 - 3.9	4.0 - 4.4	4.5 - 4.9	5.0 - 5.4	5.5 - 5.9	6.0 - 6.4	6.5 - 6.9	7.0 - 7.4
No of leaves	1	4	9	14	12	10	6	3	1

a) State the modal class.

(1 mk)

b) Calculate the median length.

(3 mks)

c) Using a working mean of 5.2, find

i) The mean.

(4 mks)

ii) The standard deviation.

(2 mks)

19. The table below shows the income tax rates for a certain year.

Taxable pay per month (sh)	Tax rates (%)
1 - 9680	10%
9681 - 18800	15%
18801 - 27920	20%
27921 - 27040	25%
Above 37040	30%

In that year Maina paid a net tax of ksh. 5512 per month. His total monthly taxable allowances amounted to ksh. 15,220 and he was entitled to a monthly personal relief of ksh. 1162. Every month the following deductions were made

- NHIF                      Ksh. 320
- Union dues              Ksh. 200
- Co-op shares            Ksh. 7500

- a) Calculate Maina's monthly basic salary in Ksh. (7 mks)  
 b) Calculate his monthly net salary. (3 mks)
21. A transformation represented by the matrix  $\begin{pmatrix} 2 & 1 \\ 1 & -2 \end{pmatrix}$  maps the points A (0, 0), B(2, 0), C(2, 3) and D(0, 3) of the quadrilateral ABCD onto  $A^1B^1C^1D^1$  respectively.
- a) Draw the quadrilateral ABCD and its image  $A^1B^1C^1D^1$ . (2 mks)  
 b) Hence or otherwise determine the area of  $A^1B^1C^1D^1$ . (2 mks)  
 c) A transformation represented by the matrix  $\begin{pmatrix} 0 & -1 \\ -1 & 0 \end{pmatrix}$  maps  $A^1B^1C^1D^1$  onto  $A^{11}B^{11}C^{11}D^{11}$ . Draw the image  $A^{11}B^{11}C^{11}D^{11}$ . (2 mks)  
 d) Determine the single matrix which maps  $A^{11}B^{11}C^{11}D^{11}$  back to ABCD. (4 mks)
21. a) In a F4 class there are 22 girls and 18 boys. The probability that a girl completes the secondary education course is  $\frac{3}{5}$  whereas that of a boy is  $\frac{2}{3}$ . A student is picked at random from the class. Find the probability that the student picked:
- i) Is a boy and will complete the course. (2 mks)  
 ii) Will complete the course. (2 mks)  
 iii) Is a girl and will not complete the course. (2 mks)
- b) A bag, contains 5 blue balls, 8 red balls and 3 green balls being similar in shape and size. A ball is picked out at random without replacement and its colour noted. Use a tree diagram to determine the probability that at least one of first two balls picked is green. (4 mks)
22. a) Complete the table below from the functions  $y = \cos x$  and  $y = 2 \cos (x + 30)$  for  $0 \leq x \leq 360$
- |                   |      |      |     |      |      |      |      |      |     |     |     |      |      |
|-------------------|------|------|-----|------|------|------|------|------|-----|-----|-----|------|------|
| $x^0$             | 0    | 30   | 60  | 90   | 120  | 150  | 180  | 210  | 240 | 270 | 300 | 330  | 360  |
| $\cos x$          | 1    | 0.87 | 0.5 | -1.0 | -0.5 | -2.0 | -1.0 | -0.5 | 1.0 | 0.5 | 0   | -0.5 | -1.0 |
| $2 \cos (x + 30)$ | 1.73 |      |     |      |      |      |      |      |     |     |     |      | 1.73 |
- (2 mks)
- b) On the same axes draw the graphs of  $y = \cos x$  and  $y = 2 \cos (x + 30)$  for  $0 \leq x \leq 360$ . (2 mks)  
 c) State the amplitude of each graph.  
 $y = \cos x$  (1 mk)  
 $y = 2 \cos (x + 30)$  (1 mk)  
 d) Use your graph to solve  
 i)  $\cos x = 2 \cos (x + 30)$  (2 mks)  
 ii)  $2 \cos (x + 30) - \frac{1}{2} = 0$  (2 mks)
23. A plane S flies from a point P ( $40^0N, 45^0W$ ) to a point Q( $35^0W, 45^0W$ ) and then onto a point T ( $35^0N, 135^0E$ ).
- a) Given that the radius of the earth is 6370km, find the distance P to Q in km. (2 mks)  
 b) Find in nm;  
 i) the shortest distance between Q and T. (2 mks)  
 ii) the longest distance between Q and T (to the nearest tens). (2 mks)  
 c) Find the difference in time taken when S flies along the shortest and longest routes if its speed is 420 knots.
24. The headteacher of a secondary school placed an order for x - lockers and y - chairs from a metal works with the following conditions:
- i) The number of chairs should be more than the number of lockers.  
 ii) The total number of lockers and chairs must not exceed 100.  
 iii) There should be at least 20 chairs and not less than 10 lockers.  
 iv) The cost of a locker is ksh. 2500 and that of a chair is ksh. 1000 and the headteacher has only ksh. 1500 to spend on lockers and chairs during the term.
- a) Write down all the inequalities describing the situation above. (4 mks)  
 b) On the grid provided, draw a graph representing the inequalities. (4 mks)  
 c) Determine the maximum number of lockers and chairs that can be bought. (2 mks)

# MARKING SCHEME

1.	<p><b>No</b>                      <b>Log</b></p> $(93.4)^2 \quad 1.9703 \times 2$ $0.00435 \quad \frac{3.9406}{2} = 1.8193$ $\log 6.56 (0.8169) \quad \frac{2.7599}{2.8477} = 1.1912$ $7.0421 \times 10^2 \leftarrow$ $= 704.21$ <p style="text-align: right;">+ M1 all logos M1 sqr &amp; sqrt M1 operation + - ÷</p>	<p>Z.</p> $x^2 - 6x + y^2 + 8y = -51/4$ $x^2 - 6x + 9 + y^2 + 8y + 16 = -51/4 + 25$ <p style="text-align: center;">M1 completely square</p> $(x - 3)^2 + (y + 4)^2 = 49/4$ <p style="text-align: right;">M1</p> <p>Centre (3, -4) Radius 3.5 units</p> <p style="text-align: right;">A1 for both</p>
2.	<p>Rono : <math>A = P + P \times \frac{24}{100} \times 8</math></p> $= 1.92P + P = 2.92P$ <p style="text-align: right;">M1</p> <p>Wekesa <math>A = 2p(1 + \frac{r}{100})^4</math></p> $2.92P = 2p(1 + \frac{r}{100})^4$ <p style="text-align: right;">M1</p> $1.46 = (1 + \frac{r}{100})^4$ $4 \quad 1.46 = 1 + \frac{r}{100}$ $r = 9.923\%$ <p style="text-align: right;">A1</p>	<p>8</p> $\frac{dy}{dx} = 2x - 4$ $x = 3; \frac{dy}{dx} = 2$ $y = 2x + C$ $1 = 6 + C$ $C = -5$ $y = 2x - 5$ <p style="text-align: right;">M1 (dy/dx) A1</p>
3.	$AB = \begin{bmatrix} -2 \\ -1 \\ 2 \end{bmatrix} - \begin{bmatrix} 2 \\ -3 \\ 4 \end{bmatrix} = \begin{bmatrix} -4 \\ 2 \\ -2 \end{bmatrix}$ $ AB  = \sqrt{(-4)^2 + 2^2 + (-2)^2} = 24$ <p style="text-align: right;">M1</p> $ AB  = 4.90 \text{ units}$ <p style="text-align: right;">A1</p>	<p>9</p> <p>10</p> <p>1kg mixture <math>= \frac{40 \times 3 + 60 \times 1}{4} = \text{sh. } 45</math></p> <p style="text-align: right;">M1</p> $45x + 50y = 47$ <p style="text-align: right;">M1</p> $x + y$ $45x + 50y = 47x + 47y$ $3y = 24$ $\frac{x}{y} = \frac{3}{2}$ $x : y = 3 : 2$ <p style="text-align: right;">A1</p>
4.	$L^2 = \frac{4}{9} \left( \frac{x^2 - PT}{y} \right)$ <p style="text-align: right;">M1 sqrs</p> $\frac{9L^2y}{4} = x^2 - PT$ $PT = x^2 - \frac{9L^2y}{4}$ <p style="text-align: right;">M1 separately</p> $P = x^2 - \frac{9L^2y}{4}$ <p style="text-align: right;">A1</p>	<p>11</p> $6(1 - \cos^2x) - \cos x - 5 = 0$ $1 - 6\cos^2x - \cos x = 0$ $6\cos^2x + \cos x - 1 = 0$ <p style="text-align: right;">M1</p> <p>Let <math>\cos x = y</math></p> $6y^2 + y - 1 = 0$ $(2y + 1)(3y - 1) = 0$ $y = -0.5 \text{ or } y = 0.3333$ <p style="text-align: right;">M1</p> $\cos x = -0.5$ $x = 120^\circ, 240^\circ$ $\cos x = 0.3333$ $x = 70.5, 289.5$ <p style="text-align: right;">A1, A1</p> $x = 70.5^\circ, 120^\circ, 240^\circ, 289.5^\circ$
5.	<p>1 min tap (A &amp; B) = <math>\frac{1}{A} + \frac{1}{B} = \frac{1}{6}</math> of work</p> $\frac{1}{B+5} + \frac{1}{B} = \frac{1}{6}$ <p style="text-align: right;">M1 forming eqn</p> $B^2 - 7B - 30 = 0$ <p style="text-align: right;">M1 simplified eqn.</p> $(B - 10)(B + 3) = 0$ $B = 10 \text{ minutes}$ <p style="text-align: right;">A1</p>	<p>12.</p> $\frac{\sqrt{14}(\sqrt{7} + \sqrt{2}) - \sqrt{14}(\sqrt{7} - \sqrt{2})}{(\sqrt{7} - \sqrt{2})(\sqrt{7} + \sqrt{2})}$ <p style="text-align: right;">M1</p> $\frac{7\sqrt{2} + \sqrt{28} - 7\sqrt{2} + \sqrt{28}}{5}$ <p style="text-align: right;">M1</p> $= \frac{2\sqrt{28}}{5} = \frac{4\sqrt{7}}{5} = a\sqrt{7} + b\sqrt{2}$ $a = \frac{4}{5} \quad b = 0$ <p style="text-align: right;">A1 both</p>
6.	$\frac{2^{2x} + 2^{2x}}{2} \times 16 = 264$ $2^{2x} + 32(2^{2x}) = 528$ <p style="text-align: right;">M1</p> $33(2^{2x}) = 528$ $2^{2x} = 16 = 2^4$ <p style="text-align: right;">M1</p> $x = 2$ <p style="text-align: right;">A1</p>	

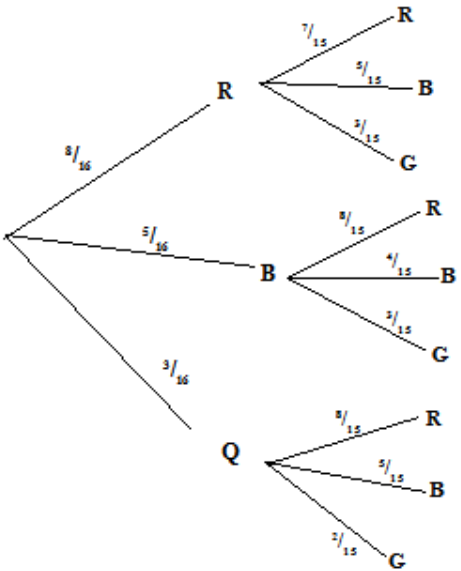
<p><b>13</b></p>	$(2 + 1/4x)^6$ $= 2^6 + 6 \times 2^5 \times (1/4x) + 15 \times 2^4 \times (1/4x)^2$ $+ 20 \times 2^3 \times (1/4x)^3 + 15 \times 2^2 \times (1/4x)^4$ $= 64 + 48x + 15x^2 + 5/2x^3 + 15/64x^4$ $x = -0.1$ $64 + 48(-0.1) + 15(-0.1)^2 + 5/2(-0.1)^3$ $+ 15/64(-0.1)^4$ $= 59.34752$ <p>M1 M1 M1 A1</p>	$9/10h = 2/5 \Rightarrow h = 4/9$ $k = 3/2 \times 4/9 = 2/3$ <p>A1 both h and k</p> <p>c) <math>MN = 4/9MC</math> M1  <math>MN \parallel MC</math>  M common  Hence M, N &amp; C are collinear A1</p>
<p><b>14</b></p>	$y = kx + \frac{m}{x^2}$ $4 = 2k + \frac{m}{4} \Rightarrow 8k + m = 16$ <p>M1 both eqn</p> $6.25 = 4k + \frac{m}{16}$ $\frac{64k + m = 100}{56k = 84}$ $k = 3/2$ <p>M1 (both m &amp; k)</p> $m = 4$ $\text{eqn } y = \frac{3x + 4}{2x^2}$ <p>A1 (eqn)</p>	<p><b>19</b></p> <p>Gross tax = (5512 + 1162) = sh. 6674 M1, A1  Rate Total</p> <p>1st 9680 = 9680 x 10/100 = 968 M1</p> <p>2nd 9120 = 9120 x 15/100 = 1368 M1</p> <p>3rd 9120 = 9120 x 20/100 = 1824</p> <p>4th 9120 = 9120 x 25/100 = 2280</p> <p>5th <math>x = 780 = x \times 30/100 = \frac{234}{6674}</math> B1, B1</p> <p>Total = 37,820  Basic salary = 37820 - 15220 M1  = Ksh. 22,600 A1  Net pay = 37820 - 13532 M1  = Sh. 24,288 A1</p>
<p><b>15</b></p>	$(a + 10d) = 4(a + d)$ $a + 10d = 4a + 4d$ $6d = 3a$ $a = 2d$ <p>M1</p> $175 = 7/2(2a + 6d)$ <p>M1</p> $50 = 2a + 6d \Rightarrow 50 = 10d$ $d = 5$ $a = 2 \times 5 = 10$ <p>A1 (both)</p>	<p><b>20</b></p> <p>c) <math display="block">\begin{matrix} A^1 B^1 C^1 D^1 &amp; A^1 B^1 C^1 D^1 \\ 0 &amp; -1 \begin{pmatrix} 0 &amp; 4 &amp; 7 &amp; 3 \end{pmatrix} = \begin{pmatrix} 0 &amp; -2 &amp; 4 &amp; 6 \\ -1 &amp; 0 \end{pmatrix} \begin{pmatrix} 2 &amp; 1 \\ 1 &amp; -2 \end{pmatrix} = \begin{pmatrix} -1 &amp; 2 \\ -2 &amp; -1 \end{pmatrix} \end{matrix}</math> M1</p> <p><math>A^1(0,0) B^1(-2,-4) C^1(4,-7) D^1(6,-3)</math></p> <p>d) Single matrix which maps ABCD onto <math>A^{11}B^{11}C^{11}D^{11}</math> is given by</p> <p>Single matrix which maps <math>A^{11}B^{11}C^{11}D^{11}</math> back to ABCD is  Inverse <math>\begin{pmatrix} -1 &amp; 2 \\ -2 &amp; -1 \end{pmatrix}</math> M1</p> <p><math display="block">= \begin{pmatrix} -1/5 &amp; -2/5 \\ 2/5 &amp; -1/5 \end{pmatrix}</math> A1</p>
<p><b>16</b></p>	$16 - x^2 \Rightarrow x \pm 4$ <p>M1</p> $\int_0^4 (16 - x^2) = [16x - x^3/3]_0^4$ <p>M1 integral</p> $64 - 64/3 = 42\frac{2}{3}$ <p>A1</p>	
<p><b>17</b></p>	<p>a) i) <math>\underline{BA} = \underline{a} - \underline{b}</math> M1  ii) <math>\underline{MC} = \frac{3}{2}\underline{a} - \frac{3}{5}\underline{b}</math> M1</p> <p>b) <math>\underline{MN} = h(\frac{3}{2}\underline{a} - \frac{3}{5}\underline{b})</math>  <math>= \frac{3}{2}h\underline{a} - \frac{3}{5}h\underline{b}</math> M1  <math>\underline{MN} = \underline{MB} + \underline{BN}</math>  <math>= \frac{2}{5}\underline{b} + k(\underline{a} - \underline{b})</math>  <math>= k\underline{a} + (\frac{2}{5} - k)\underline{b}</math> M1  <math>\frac{3}{2}h\underline{a} - \frac{3}{5}h\underline{b} = k\underline{a} + (\frac{2}{5} - k)\underline{b}</math>  M1 equation equations  <math>\frac{3}{2}h = k</math>  <math>-\frac{3}{5}h = \frac{2}{5} - k</math> M1 two equations  <math>-\frac{3}{5}h = \frac{2}{5} - \frac{3}{2}h</math>  <math>\frac{3}{2}h - \frac{3}{5}h = \frac{2}{5}</math> M1 attempt to solve</p>	

18	Class	x	x - 5.2	f	fd	d <sup>2</sup>	fd <sup>2</sup>	c.f
	3.0 - 3.4	3.2	-2	1	-2	4	4	1
	3.5 - 3.9	3.7	-1.5	4	-6	2.25	9	5
	4.0 - 4.4	4.2	-1.0	9	-9	1	9	14
	4.5 - 4.9	4.7	-0.5	14	-7	0.25	3.5	28
	5.0 - 5.4	5.2	0	12	0	0	0	40
	5.5 - 5.9	5.7	0.5	10	5	0.25	2.5	50
	6.0 - 6.4	6.2	1.0	6	6	1	6	56
	6.5 - 6.9	6.7	1.5	3	4.5	2.25	6.75	59
	7.0 - 7.4	7.2	2	1	2	4	4	60
				-6.5		44.75		

<p>Modal class : 4.5 - 4.9</p> <p>Median = <math>4.95 + \frac{30 - 28}{12} \times 0.5</math></p> <p>= <math>4.95 + \frac{2}{12} \times 0.5</math></p> <p>= <math>4.95 + 0.0833</math></p> <p>= 5.0333</p>	A1 M1  A1	$(\frac{8}{16} \times \frac{3}{15}) + (\frac{5}{16} \times \frac{3}{15}) + (\frac{3}{16} \times \frac{8}{15}) +$ $(\frac{3}{16} \times \frac{5}{15}) + (\frac{3}{16} \times \frac{2}{15})$	M1
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<p>Mean = <math>5.2 + \frac{-6.5}{60}</math></p> <p>= <math>5.2 - 0.1083 = 5.0917</math></p> <p>M1A1</p>	M1	23	<p>a) <math>Q = 5^0</math></p> <p><math>PQ = \frac{5}{360} \times 2 \times \frac{22}{7} \times 6370</math></p> <p>= 556.11km</p>	M1 A1
<p>s.d = <math>\sqrt{\frac{44.75}{60} - \left(\frac{-6.5}{60}\right)^2}</math></p> <p>= <math>0.7458 - 0.01174 = \sqrt{0.7341}</math></p> <p>= 0.8568</p>	M1 A1	<p>b) i) <math>\Theta = 2(90 - 35) = 110^0</math></p> <p>Distance = <math>60 \times 110^0 = 6600\text{nm}</math></p> <p>ii) <math>\Theta = 135 + 45 = 180^0</math></p> <p><math>180^0 \times 60 \cos 45^0 = 8846.84</math></p> <p>= 8850nm</p>	M1 A1 M1 A1	

21	<p>a) i) <math>\frac{18}{40} \times \frac{2}{3} = \frac{3}{10}</math></p> <p>ii) <math>(\frac{18}{40} \times \frac{2}{3}) + (\frac{22}{40} \times \frac{3}{5}) = \frac{3}{10} + \frac{33}{100}</math></p> <p>= <math>\frac{63}{100}</math></p> <p>iii) <math>\frac{22}{40} \times \frac{2}{5} = \frac{11}{100}</math></p>		<p>c) <math>S = 5 \times 60 + 6600 = 6900</math></p> <p>Time = <math>\frac{6900}{420} = 16.429\text{hrs}</math></p> <p><math>S = 5 \times 60 + 8850 = 9150</math></p> <p>Time = <math>\frac{9150}{420} = 21.78\text{hrs}</math></p> <p>Time difference = <math>21.78 - 16.429</math></p> <p>= 5.357hrs or</p> <p>5hrs 21.42min</p>	M1 M1 M1 A1
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<p>b)</p> 		24	<p><math>y &gt; x</math></p> <p><math>y + x &lt; 100</math></p> <p><math>y \geq 20</math></p> <p><math>x \geq 10</math></p> <p><math>2500x + 100y \leq 150,000</math></p> <p><math>5x + 2y \leq 300</math></p> <p><math>y &gt; x</math> drawn &amp; shaded</p> <p><math>y + x \leq 100</math> drawn &amp; shaded</p> <p><math>y \geq 20</math></p> <p><math>x \geq 10</math></p> <p>33 lockers</p> <p>67 chairs</p>	B1 B1 B1 (both) B1 B1 B1 B1 B1 B1
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