

# SHARP

## November Exam Memorandum

### Grade 9 Mathematics

Marks: 150

Time: 2 hours

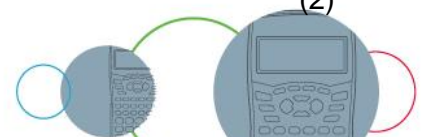
#### Notes

1. This answer paper consists of 13 pages and 2 sections.
2. There are other possible ways to answer some of the questions than those answers given here. However, the final answer should still be the same.
3. Should you find any errors in the test during your moderation please do let us know via email: [mathsatsharp@seartec.co.za](mailto:mathsatsharp@seartec.co.za) so that we can correct it as soon as possible. We really appreciate your help towards making this a fantastic free resource for all maths teachers across South Africa.

### Section 1 - Algebra

#### Question 1

1.1.	1.1.1.	$\begin{array}{r l} 360 & 2 \\ 180 & 2 \\ 90 & 2 \\ 45 & 3 \\ 15 & 3 \\ 5 & 5 \\ 1 & \end{array}$		$\begin{array}{r l} 252 & 2 \\ 126 & 2 \\ 63 & 3 \\ 21 & 3 \\ 7 & 7 \\ 1 & \end{array}$		$\begin{array}{r l} 240 & 2 \\ 120 & 2 \\ 60 & 2 \\ 30 & 2 \\ 15 & 3 \\ 5 & 5 \\ 1 & \end{array}$
		$360 = 2^3 \times 3^2 \times 5 \quad \checkmark$		$252 = 2^2 \times 3^2 \times 7 \quad \checkmark$		$240 = 2^4 \times 3 \times 5 \quad \checkmark (3)$
	1.1.2.	$HCF = 2^2 \times 3 = 12 \quad \checkmark$				
		$LCM = 2^4 \times 3^2 \times 5 \times 7 = 5\,040 \quad \checkmark$				(2)



1.2. 1.2.1.  $\sqrt{(-9)(-4)} + \frac{42}{-7}$  (3)

$= \sqrt{36} - 6$  ✓

$= 6 - 6$  ✓

$= 0$  ✓

Please note: The question specifically asks that no calculator is used, this means that the steps must be shown and marks awarded for the steps. If only the answer is given only one mark should be given.

1.2.2.  $\sqrt[3]{-27} - \sqrt{25}$  (2)

$= -3 - 5$  ✓

$= -8$  ✓

1.2.3.  $3\frac{2}{5} \div 3\frac{4}{7} \div 0.35$  (3)

$= \frac{17}{5} \div \frac{25}{7} \div \frac{35}{100}$  ✓

$= \frac{17}{5} \times \frac{7}{25} \times \frac{100}{35}$  ✓

$= \frac{68}{25}$  or  $2\frac{18}{25}$  ✓

1.3. 1.3.1. The bank owns  $= 1 - \frac{1}{4} - 0.4 - 35\%$  (2)

$= 1 - 0.25 - 0.4 - 0.35$  ✓

$= 0$  ✓

The bank does not own a part of the business.

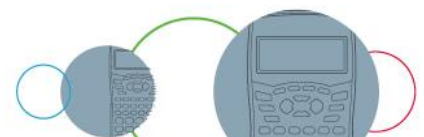
1.3.2. Henrietta =  $R250\ 000 \times \frac{1}{4} = R62\ 500$  ✓ (3)

Yvonne =  $R250\ 000 \times 0.4 = R100\ 000$  ✓

Kimberley =  $R250\ 000 \times 35\% = R87\ 500$  ✓

1.4. 3 741 360 000 =  $3.74136 \times 10^9$  ✓ (1)

1.5.  $5.627 \times 10^{-5}$  = 0.00005627 ✓ (1)



$$\begin{aligned}
 1.6. \quad & \frac{(x^3y^{-4})^2}{(x^2y^{-3})^{-2}} \times \frac{x^3y^0}{y^5} && (3) \\
 & = \frac{x^6y^{-8}}{x^{-4}y^6} \times \frac{x^3}{y^5} && \checkmark \\
 & = \frac{x^6x^4}{y^6y^8} \times \frac{x^3}{y^5} && \checkmark \\
 & = \frac{x^{13}}{y^{19}} && \checkmark
 \end{aligned}$$

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## Question 2

2.1. Given the following table:

<b>x</b>	1	2	3	4	<b>b</b>	9	<b>d</b>
<b>y</b>	15	12	9	<b>a</b>	0	<b>c</b>	-24

2.1.1.  $a = 6$        $\frac{1}{2}$  mark                       $b = 6$                        $\frac{1}{2}$  mark                      (2)

$c = -9$        $\frac{1}{2}$  mark                       $d = 14$                        $\frac{1}{2}$  mark

2.1.2.  $T_n = -3n + 18$                        $\checkmark\checkmark$                       (2)

2.1.3.  $T_{100} = -3(100) + 18$                       (1)

$T_{100} = -282$                        $\checkmark$

2.2. 2.2.1. String  $\xrightarrow{\checkmark \div 2}$   $\xrightarrow{\checkmark + 1.5\text{cm}}$   $\xrightarrow{\checkmark + 1.5\text{cm}}$  Answer (3)

2.2.2.  $18 \xrightarrow{\div 2 = 9} 9 + 1.5 = 10.5 \xrightarrow{\checkmark} 10.5 + 1.5 \xrightarrow{\checkmark} 12\text{cm}$  (2)

2.2.3.  $7 - 1.5\text{cm} = 5.5\text{cm}$                        $\checkmark$

$5.5 - 1.5\text{cm} = 4\text{cm}$                        $\checkmark$

$4 \times 2 = 8\text{cm}$                        $\checkmark$                       (3)

2.2.4.

(2)

<b>Input</b>	12cm	20cm	50cm	84cm
<b>Output</b>	9cm	13cm	28cm	45cm

2.3. 2.3.1.  $m = -3$

✓

(3)

y-intercept = 9

✓

x – intercept:  $0 = -3x + 9$

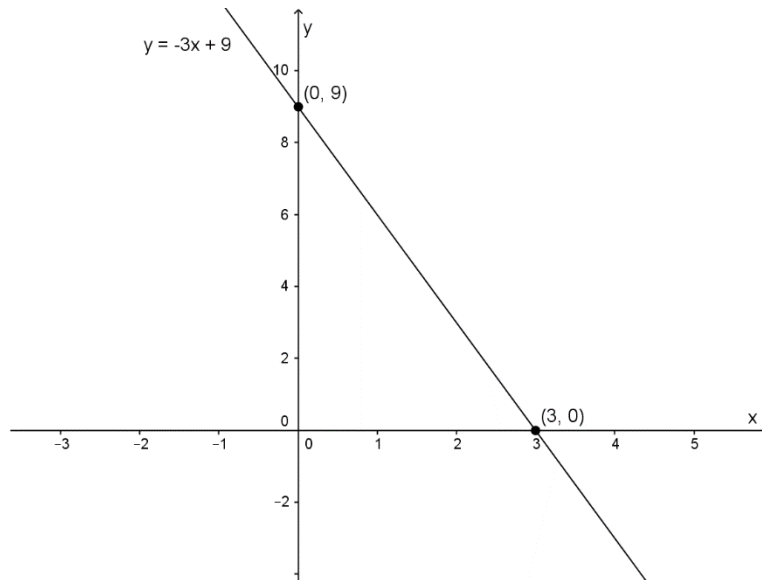
$$-9 = -3x$$

$$x = 3$$

✓

2.3.2.

(3)



Mark for y-intercept and for x-intercept

✓

Mark for drawing graph correctly

✓

Mark for labeling axes.

✓

2.3.3. Decreasing

✓

(1)



2.4. For graph a:  $\text{gradient} = \frac{y_2 - y_1}{x_2 - x_1}$

$$= \frac{4 - 3}{0 - 2}$$

$$= \frac{1}{-2} \text{ or } -\frac{1}{2} \quad \checkmark$$

So:  $y = -\frac{1}{2}x + c$       Substitute in a point

$$4 = -\frac{1}{2}(0) + c$$

$$c = 4 \quad \checkmark$$

$$\therefore y_a = -\frac{1}{2}x + 4$$

For graph b:  $\text{gradient} = \frac{y_2 - y_1}{x_2 - x_1}$

$$= \frac{3 - 0}{2 - (-2)}$$

$$= \frac{3}{2 + 2}$$

$$= \frac{3}{4} \quad \checkmark$$

So  $y = \frac{3}{4}x + c$       Substitute in a point

$$3 = \frac{3}{4}(2) + c$$

$$c = 1\frac{1}{2} \quad \checkmark$$

$$\therefore y_b = \frac{3}{4}x + 1\frac{1}{2} \quad (4)$$

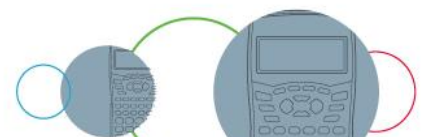
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### Question 3

3.1. 3.1.1. a and b       $\checkmark$       (1)

3.1.2.  $-9b^3 - 11$ .       $\checkmark\checkmark$       (2)

3.1.3. 12       $\checkmark$       (1)



$$3.1.4. \quad 7a^4b^3 + 6a^2b - 9ab^3 - 11a + 12 \quad \text{with } a = -2 \text{ and } b = 3 \quad (3)$$

$$= 7(-2)^4(3)^3 + 6(-2)^2(3) - 9(-2)(3)^3 - 11(-2) + 12 \quad \checkmark$$

$$= 7(16)(27) + 6(4)(3) - 9(-2)(27) + 22 + 12 \quad \checkmark$$

$$= 3\,024 + 72 + 486 + 22 + 12$$

$$= 3\,616 \quad \checkmark$$

$$3.2. \quad 3.2.1. \quad (9x + 4)(8x - 7) + \frac{x^2 + 10x + 21}{x + 3} \quad (4)$$

$$= 72x^2 - 63x + 32x - 28 + \frac{(x+3)(x+7)}{(x+3)} \quad \checkmark\checkmark$$

$$= 72x^2 - 31x - 28 + x + 7 \quad \checkmark$$

$$= 72x^2 - 30x - 21 \quad \checkmark$$

$$3.2.2. \quad (x - 6)^2 + (x - 6)(x + 6) \quad (3)$$

$$= (x - 6)(x - 6) + (x - 6)(x + 6)$$

$$= x^2 - 12x + 36 \quad \checkmark \quad + x^2 - 36 \quad \checkmark$$

$$= 2x^2 - 12x \quad \checkmark$$

$$3.3. \quad 3.3.1. \quad \frac{x+3}{4} + \frac{x-6}{5} = 12 \quad (4)$$

$$\frac{5(x+3)}{20} + \frac{4(x-6)}{20} = \frac{12(20)}{20} \quad \checkmark\checkmark$$

$$5x + 15 + 4x - 24 = 240 \quad \checkmark$$

$$9x = 240 + 24 - 15$$

$$9x = 249$$

$$x = 27\frac{2}{3} \quad \checkmark$$

$$3.3.2. \quad x^2 + 10 = -7x \quad (2)$$

$$x^2 + 7x + 10 = 0$$

$$(x + 5)(x + 2) = 0$$

$$x + 5 = 0 \text{ or } x + 2 = 0$$

$$x = -5 \text{ or } x = -2 \quad \checkmark\checkmark$$

$$3.3.3. \quad (x + 3)(x - 8) = -4x \left(4 + \frac{13}{x}\right) \quad (3)$$

$$x^2 - 5x - 24 = -16x - 52 \quad \checkmark$$

$$x^2 - 5x + 16x - 24 + 52 = 0$$

$$x^2 + 11x + 28 = 0 \quad \checkmark$$

$$(x + 4)(x + 7) = 0$$

$$x = -4 \text{ or } x = -7 \quad \checkmark$$

$$3.4. \quad (x + 3)(x + 7) = 5cm \quad \checkmark \quad (4)$$

$$x^2 + 10x + 21 - 5 = 0$$

$$x^2 + 10x + 16 = 0$$

$$(x + 2)(x + 8) = 0$$

$$x = -2 \text{ or } x = -8 \quad \checkmark$$

Not possible (as it would make the length and breadth negative which is impossible)  $\checkmark$

$$\therefore \text{Length} = -2 + 3cm = 1cm \text{ and breadth} = -2 + 7cm = 5cm \quad \checkmark$$

[27]

## Section 2 - Geometry

### Question 4

- 4.1. Base is 5cm  $\checkmark$   
2 angles both  $30^\circ$   $\checkmark$   
Other two sides equal  $\checkmark$   
Drawn neatly in pencil  $\checkmark$   
Clearly and neatly labeled.  $\checkmark$  (5)

- 4.2. All three sides 3.5cm  $\checkmark$   
All three angles  $60^\circ$   $\checkmark$   
Drawn neatly and in pencil and labelled.  $\checkmark$  (3)

- 4.3. 4.3.1. In  $\triangle BEC$  and  $\triangle BDC$ .

1.  $BE = DC$  Given  $\checkmark$   
2.  $\hat{E}BC = \hat{C}BD$  Alt angles,  $BA \parallel DF$   $\checkmark$   
3.  $BC$  is common  $\checkmark$   
 $\therefore \triangle BEC \equiv \triangle BDC$  (SAS)  $\checkmark$  (4)

- 4.3.2. Rectangle  $\checkmark$   
opposite sides equal and parallel AND all four angles are  $90^\circ$   $\checkmark$  (2)

- 4.3.3.  $\hat{D}BC = \hat{B}CE$   $\checkmark$  Alternating angles,  $BD \parallel EC$   $\checkmark$  (4)  
 $\hat{B}CE = \hat{C}EF$  Alternating angles,  $BC \parallel EF$   $\checkmark$   
 $\therefore \hat{D}BC = \hat{C}EF$  Both equal to  $\hat{B}CE$   $\checkmark$



4.4. 4.4.1. In  $\triangle ABC$  and  $\triangle ACD$ .

- |    |  |                        |                    |     |
|----|--|------------------------|--------------------|-----|
| 1. | $B\hat{C}A = C\hat{A}D$                            | Alternating angles     | $\frac{1}{2}$ mark |     |
| 2. | $B\hat{A}C = A\hat{C}D$                            | Alternating angles     | $\frac{1}{2}$ mark |     |
| 3. | $A\hat{B}C = A\hat{D}C$                            | Last angle in triangle | $\frac{1}{2}$ mark |     |
|    | $\therefore \triangle CAB \parallel \triangle ACD$ |                        | $\frac{1}{2}$ mark | (2) |

4.4.2. Any two of the following angles:

- |                                    |                                  |              |     |
|------------------------------------|----------------------------------|--------------|-----|
| $G\hat{C}D = A\hat{D}C = 30^\circ$ | Alt angles, $AD \parallel BG$    | $\checkmark$ | (2) |
| $G\hat{C}D = A\hat{B}C = 30^\circ$ | Corrsp angles, $BE \parallel CD$ | $\checkmark$ |     |
| $A\hat{B}C = E\hat{A}D = 30^\circ$ | Corrsp angles, $AD \parallel BG$ | $\checkmark$ |     |

4.4.3.  $D\hat{A}B + A\hat{B}C + B\hat{C}D + A\hat{D}C = 360^\circ$  Sum of angles in quad =  $360^\circ$   $\checkmark$  (3)

and  $D\hat{A}B = B\hat{C}D = y$  Opp. Angles of rhombus  $\checkmark$

$$\therefore y + 30^\circ + y + 30^\circ = 360^\circ$$

$$2y = 300^\circ$$

$$\therefore y = 150^\circ$$

$$\therefore A\hat{C}D = \frac{1}{2}y = 75^\circ$$
 Diags bisect angles in rhombus  $\checkmark$

[25]

### Question 5

5.1. 5.1.1.  $AB^2 = BG^2 + AG^2$  Pythag  $\checkmark$

$$AG^2 = 10.84^2 - \left(\frac{18.78}{2}\right)^2 \quad \checkmark\checkmark$$

$$AG^2 = 29.3335$$

$$AG = \sqrt{29.3335}$$

$$AG = 5.42m$$

$\checkmark$  (4)



5.1.2.  $P = 6 \times 10.84\text{m}$  ✓ (2)

$P = 65.04\text{m}$  ✓

5.13.  $A = \text{area of rectangle} + 2 \times \text{area of triangles}$  (2)

$A = l \times b + 2 \left( \frac{1}{2} \times b \times h \right)$

$A = 18.78 \times (21.68 - 2 \times 5.42) + 2 \left( \frac{1}{2} \times 18.78 \times 5.42 \right)$

$A = 203.58\text{m}^2 + 101.79\text{m}^2$

$A = 305.37\text{m}^2$

5.1.4. Area of circle =  $\pi r^2$

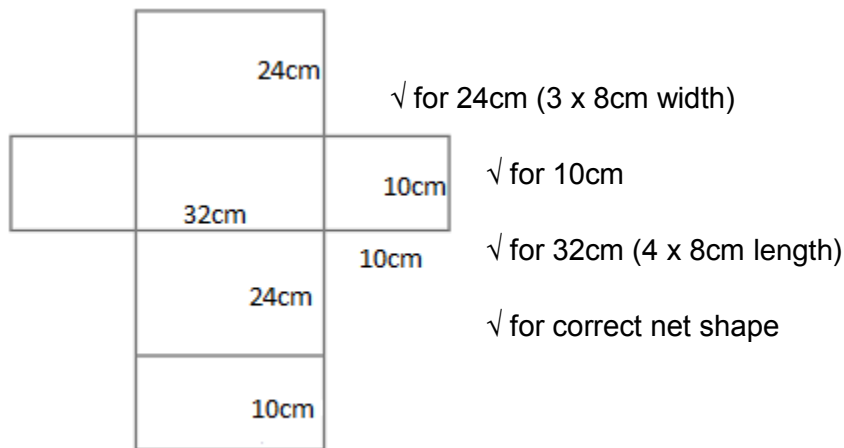
Area =  $\pi \left( \frac{21.68}{2} \right)^2$  ½ mark

Area =  $369.15\text{m}^2$  ½ mark

Circle area seen =  $369.15 - 305.37$

$= 63.78\text{m}^2$  (2)

5.2. 5.2.1. (4)



5.2.2.  $SA = 2(l \times b + l \times h + h \times b)$  ✓ (3)

$SA = 2(32\text{cm} \times 24\text{cm} + 10\text{cm} \times 32\text{cm} + 24\text{cm} \times 10\text{cm})$  ✓

$SA = 2\ 656\text{cm}^2$

5.2.3. Volume = l x b x h (4)

Volume of box = 24cm x 32cm x 10cm

Volume of box = 7 680cm<sup>3</sup> ✓

Volume of one toilet roll =  $\pi r^2 h$

=  $\pi \times \left(\frac{8}{2}\right)^2 \times 10$  ✓

= 502.65cm<sup>3</sup>

Left over volume = volume of box – 12 x volume of toilet roll ✓

= 7 680cm<sup>3</sup> – 12 x 502.65cm<sup>3</sup>

= 1648.2cm<sup>3</sup> ✓

5.3. 5.3.1. Dodecahedron ✓ 5.3.2. Octahedron ✓

5.3.3. Hexagonal prism ✓ (3)

[24]

**Question 6**

6.1. (5)

Original Point	Image	Rule
(-8; 1)	(1; -8)	Reflected about the line $y = x$ ✓
(-4; -1) ✓	(-1, -3)	Translate 3 units right and 2 units down
(3; 2)	(12; 8) ✓	Enlarge by a factor of 4
(5; -5)	(5; 5)	Reflect around the x-axis ✓
(2; 4) ✓	(-2; 4)	Reflect about the y-axis

6.2. 6.2.1. The perimeter will become 3 times smaller ✓ (1)

6.2.2. The area will become 9 times smaller ✓✓ (2)

[8]



**Question 7**

7.1.

Colour	Tally	Frequency
Red	//	2
Blue	HHH	5
Silver	IIII	4
Green	HHH I	6
White	HHH I	6
Yellow	HHH	5

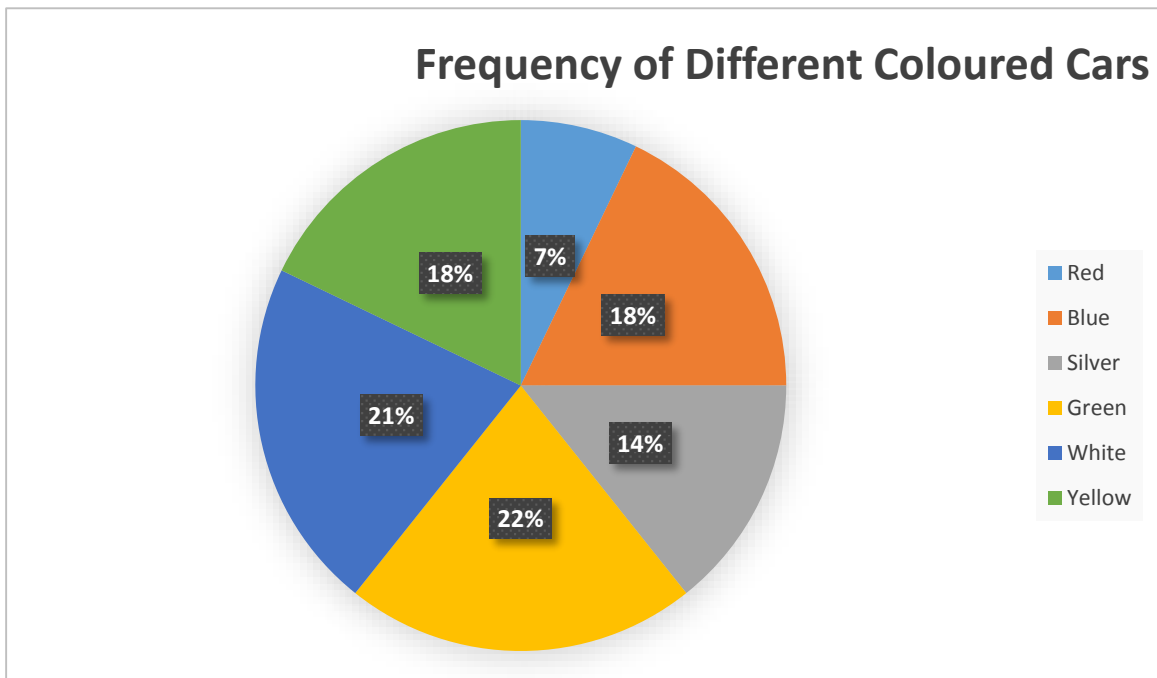
(2)

7.2. Green and white

√√

(2)

7.3.



(4)

$$\text{Red} = \frac{2}{28} \times 360^\circ = 26^\circ$$

$$\text{Green} = \frac{6}{28} \times 360^\circ = 77^\circ$$

$$\text{Blue} = \frac{5}{28} \times 360^\circ = 64^\circ$$

$$\text{White} = \frac{6}{28} \times 360^\circ = 77^\circ$$

$$\text{Silver} = \frac{4}{28} \times 360^\circ = 51^\circ$$

$$\text{Yellow} = \frac{5}{28} \times 360^\circ = 64^\circ$$

7.4. 7.4.1. Average =  $\frac{28+79+35+16+34}{5}$  √ (2)

=  $\frac{192}{5}$

= 38.4 cars √

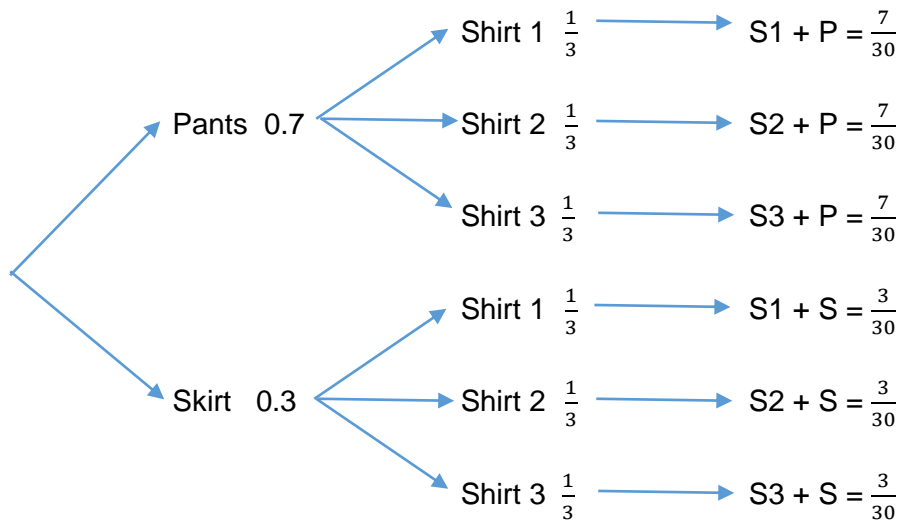
7.4.2. Range = 79 – 16 = 63 √ (1)

7.4.3. Tuesday, it has the highest number of cars, which would be over peak hour traffic. (2)

[13]

**Question 8**

8.1.



(2)

8.2. P (pants and Shirt 1) =  $\frac{7}{30}$

√√

(2)

[4]

**Total [150]**

