basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

ANNUAL NATIONAL ASSESSMENT

GRADE 9

MATHEMATICS

MEMORANDUM

SET 1: 2012 EXEMPLAR

ANNUAL NATIONAL ASSESSMENT 2012

GRADE 9 MATHEMATICS

EXEMPLAR MEMORANDUM

REAL NUMBER SYSTEM

<table>
<tr><td>1.
1.1.1</td><td>$4^{1/2}$ - rational</td><td>(1)</td></tr>
<tr><td>1.1.2</td><td>$\sqrt{2}$ - irrational</td><td>(1)</td></tr>
<tr><td>1.1.3</td><td>0,2- rational</td><td>(1)</td></tr>
<tr><td></td><td></td><td></td></tr>
<tr><td>1.2</td><td>
<table>
<tr><th>NUMBERS</th><th>REAL</th><th>NON - REAL</th><th>UNDEFINED</th></tr>
<tr><td>$\frac{0}{7}$</td><td>√</td><td></td><td></td></tr>
<tr><td>$\frac{7}{0}$</td><td></td><td></td><td>√</td></tr>
<tr><td>$\sqrt{7}$</td><td>√</td><td></td><td></td></tr>
<tr><td>$\sqrt{-7}$</td><td></td><td>√</td><td></td></tr>
</table>
</td><td>(4)</td></tr>
<tr><td></td><td></td><td></td></tr>
<tr><td>1.3.1</td><td>$0,7 = \frac{7}{10}$</td><td>(1)</td></tr>
<tr><td>1.3.2</td><td>$0,13 = \frac{13}{100}$</td><td>(1)</td></tr>
<tr><td>1.3.3</td><td>$2,01 = \frac{201}{100} = 2\frac{1}{100}$</td><td>(1)</td></tr>
<tr><td></td><td></td><td></td></tr>
<tr><td>1.4.1</td><td>$2,5 \times 10^3 \times 7 = 1,75 \times 10^4$</td><td>(1)</td></tr>
<tr><td>1.4.2</td><td>0,007</td><td>(2)</td></tr>
</table>

1.4.3	$1{,}12 \times 10^{-4} \times 3 \times 10^{-2} = 3{,}36 \times 10^{-6}$	(2)
1.5.1	1,6	(1)
1.5.2	$-\sqrt{5}$	(1)
1.6.1	0,152, 0,153, 0,154 anyone of the three	(1)
1.6.2	0,71; 0,72; 0,73; 0,74; 0,75; 0,76; 0,77 anyone of the seven	(1)
1.7.1	2 and 3	(2)
1.7.2	4 and 5	(2)
1.7.3	1 and 2	(2)
1.7.4	4 and 5	(2)
1.8		

	NATURAL NUMBER	**WHOLE NUMBER**	**INTEGER**	**RATIONAL**	**IRRATIONAL**	**REAL**
$\frac{7}{15}$				√		√
$\sqrt{2\frac{1}{8}}$					√	√
$\sqrt[3]{0{,}081}$					√	√
2π					√	√
$-\sqrt{16}$			√	√		√
0,528				√		√
2,6				√		√
$\frac{6}{2}$	√	√	√	√		√

1.9.1	$0,6 < 0,625 < 0,75 < 0,8$	(1)
1.9.2	$0,2 < 0,\dot{2}\dot{0} < 0,\dot{2} < 0,24$	(1)
1.9.3	$\sqrt{0,36} < \sqrt{0,366} < 0,\dot{6} < 0,69$	(1)
1.9.4	$\frac{-3}{2} < -\frac{5}{6} < -\frac{1}{6} < \frac{-2}{3}$	(1)
1.9.5	$-0,12 < -0,11 < \dot{-}0,1 < -0,0\dot{1}$	(1)

FINANCIAL MATHEMATICS

1. 1.1	Selling price=22 × $R1,50$ = $R33$ Profit= Selling price – cost price = $R33 - R20 = R13$	(3)
1.2.1 a)	18% of $R75\ 000 = R13\ 500$	(2)
b)	Tax = $R12\ 000$ + 20% of $(R97\ 500 - R80\ 000)$ = $R12\ 000 + R2\ 100$ = $R14\ 100$	(2)
c)	Tax= $R20\ 000$ + 25% of $R30\ 000$ = $R27\ 500$	(2)
d)	Tax= $R42\ 000$ + 35% of $R80\ 000$ = $R70\ 000$	(2)
1.2.2		

Taxable income	R140 000	R100 000	R230 000
Tax	R25 000	R16 000	R45

			500
1.3	Increase: $R1\ 740 - R1500 = R240$ % increase = $\frac{R240}{R1500} \times 100 = 16$		(2)
1.4	$A = P(1 + ni)$ $= R1500(1 + 2(0{,}11))$ $= R1\ 830$ or SI=$\frac{Pnr}{100} = \frac{R1500 \times 2 \times 11}{100} = R330$ Total amount = $R1500 + R330 = R1\ 830$		(2)
1.5.1	Investment = $P(1 + i)^n$ $= R2\ 750\left(1 + \frac{11{,}5}{100}\right)^7$ $= R5\ 891{,}92$		(3)
1.5.2	Interest earned= $R5\ 891{,}92 - R2\ 750 = R3\ 141{,}92$		(1)
1.6.1	$A = P(1 + i)^n$ $= R9500\left(1 + \frac{12}{100 \times 4}\right)^{8 \times 4}$ $= R24\ 463{,}29$ Interest = $R24\ 463{,}29 - R9\ 500$ $= R14\ 963{,}29$		(4)

1.6.2	$A = P(1 + i)^n$ $= R9500\left(1 + \frac{8}{100 \times 2}\right)^{8\times2}$ $= R17\ 793{,}32$ Interest=$R17\ 793{,}32 - R9\ 500$ $= R8293{,}32$		(4)
1.6.3	$A = P(1 + i)^n$ $= R9500\left(1 + \frac{6{,}5}{100 \times 12}\right)^{8\times12}$ $= R15\ 956{,}86$ Interest=$R15\ 956{,}86 - R9\ 500$ $= R6456{,}86$		(4)
1.6.4	$A = P(1 + i)^n$ $= R9500\left(1 + \frac{7{,}25}{100}\right)^{8}$ $= R16630{,}37$ Interest=$R16630{,}37 - R9\ 500$ $= R7130{,}37$		(4)

RATIO AND PROPORTION

<table>
<tr><td>1
1.1</td><td>Speed$= \frac{600}{2}$ km/h = 300 km/h</td><td></td><td>(3)</td></tr>
<tr><td>1.2</td><td><table><tr><td>MINUTES</td><td>2</td><td>4</td><td>6</td><td>8</td><td>20</td></tr><tr><td>COST</td><td>R1,60</td><td>R3,20</td><td>R4,80</td><td>R6,40</td><td>R16,00</td></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td></tr></table></td><td></td><td>(3)</td></tr>
<tr><td>1.3</td><td><table><tr><th>NO OF MEN</th><th>TIME</th></tr><tr><td>5</td><td>45</td></tr><tr><td>9</td><td>x</td></tr></table>$$x = \left(\frac{45 \times 5}{9}\right) = 25h$$OR
Time taken by 5 men = $45h$
Time taken by 1 man = $(45 \times 5)h$
Time taken by 9 men = $\left(\frac{45\times5}{9}\right) = 25h$</td><td></td><td>(3)</td></tr>
<tr><td>1.4</td><td><table><tr><th>TIME</th><th>NO OF HOURS</th></tr><tr><td>8</td><td>3</td></tr><tr><td>2</td><td>x</td></tr></table>$$2x = 8 \times 3$$$$x = 12$$OR
In 8 hours no of workers needed = 3
In 1 hour no of workers needed = 3 × 8
In 2 hours no of workers needed = 3 × 8 ÷ 2
= 12</td><td></td><td>(3)</td></tr>
</table>

1.5	<table><tr><th>NO OF KG</th><th>COST IN R</th></tr><tr><td>3</td><td>24</td></tr><tr><td>7</td><td>x</td></tr></table> $\frac{x}{24} = \frac{7}{3}$ $x = \frac{7 \times 24}{3}$ Cost = R56 **OR** Cost of 3 kg = $R24$ Cost of 1 kg = $R24 \div 3$ Cost of 7 kg = $R8 \times 7$ = $R56$		(2)
1.6.1	Direct proportion		(1)
1.6.2	$y = 5x$		(1)
1.6.3	$y = 5(25) = 125$		(1)
1.7	<table><tr><th>COST IN R</th><th>NO OF APRICOTS</th></tr><tr><td>5,60</td><td>15</td></tr><tr><td>10,08</td><td>x</td></tr></table> $\frac{15}{x} = \frac{R10,08}{R5,60}$ $x = \frac{R10,08 \times 15}{R5,60}$ $x = 27$		(3)

1.8	Cost per ℓ = $\frac{R605,50}{70}$ = $R8,65$		(3)
1.9	<table><tr><th>NO OF KG</th><th>COST IN R</th></tr><tr><td>0,35</td><td>25,10</td></tr><tr><td>1</td><td>x</td></tr></table> $\frac{x}{R25,10} = \frac{1}{0,35}$ $x = \frac{2510}{35}$ $= 71,714\ldots$ $Cost \sim R71,71$		(3)
1.10	<table><tr><th>NO OF KG</th><th>COST IN R</th></tr><tr><td>12,5</td><td>90</td></tr><tr><td>17,2</td><td>x</td></tr></table> $\frac{x}{90} = \frac{7,2}{12,5}$ $x = \frac{7,2 \times 90}{12,5}$ Cost= R51,84		(3)
1.11	<table><tr><td>Distance in km</td><td>No of ℓ</td></tr><tr><td>130</td><td>6,5</td></tr><tr><td>80</td><td>x</td></tr></table> $\frac{x}{6,5} = \frac{80}{130}$ $x = \frac{80 \times 6,5}{130}$ $x = 4$ No of ℓ = 4		(3)
1.12			(3)

	<table><tr><td>No of ℓ</td><td>No of m^2</td></tr><tr><td>5</td><td>40</td></tr><tr><td>1</td><td>x</td></tr></table> $\frac{x}{40} = \frac{1}{5}$ $x = \frac{1 \times 40}{5}$ $x = 8\,m^2$		

SPEED/TIME /DISTANCE

1. 1.1	$s \times t = d$ $120 \times t = 600$ $t = \frac{600}{120}$h $t = 5$h ∴time taken is 5 hours.		(2)
1.2	$s \times t = d$ $s \times 8 = 600$ $s = \frac{600}{8} km/h$ $s = 75\,km/h$		(2)

2.		**S (km/h)**	**T (h)**	**D (km)**	(3)
	car	100	x	1 0x	
	air	300	6-x	300(6-x)	

$$100x + 300(6 - x) = 1200$$

$$100x + 180 = 1200$$

$$-200x = -600$$

$$x = 3$$

Time by air = $(6 - 3)h$

$= 3h$

3.	x = (120 × 1,5) km = 180 km $y = \frac{\left(\frac{343,75}{2,75}\right)\text{km}}{\text{h}}$ = 125 km/h z = $\left(\frac{660}{220}\right)$h = 3h		(3)
4.	d = s × t = (5 × 0,5) km = 2,5 km s × 0,25 = 2,5 s = $\frac{2,5}{0,25}$ s = 10 km/h		(3)
5.1	Average speed = $\left(\frac{90}{12}\right)$ km/h = 7,5 km/h		(3)
5.2	Distance = $s \times t$ = (7,5 × 6) km = 45 km		(1)
6.	s × t = d (p + 20)t = q t = $\left(\frac{\text{q}}{\text{p+20}}\right)$h		(3)

EXPONENTS

1.		
1.1	$99 \times 1001^0 = 99 \times 1 = 99$	(1)
1.2	$a^2b^3 \times b^{-2}a^{-3} = a^{-1}b = \frac{b}{a}$	(1)
1.3	$\frac{a^4(b^2)^4}{a^{-3}b^5} = \frac{a^4b^8}{a^{-3}b^5} = a^7b^3$	(2)
1.4	$\frac{(8x^2)(-4x^{-2}y^3)}{(2x^{-1}y)^2} = \frac{-32x^{2-2}y^3}{4x^{-2}y^2}$ $= -8x^2y$	(3)
1.5	$\frac{2^{n+1}8^{n-1}}{2^{n-1}}$ $= \frac{2^{n+1}2^{3n-3}}{2^{n-1}}$ $= \frac{2^{3n-2}}{2^{n-1}}$ $= 2^{3n-1}$	(3)
1.6	$\frac{15^x.3^{x+1}.25^x}{9^{x+1}.125^x}$ $=\frac{3^x.5^x.3^{x+1}.5^{2x}}{3^{2x+2}5^{3x}}$ $=\frac{3^{2x+1}.5^{3x}}{3^{2x+2}5^{3x}}$ $= 3^{-1}$ $= \frac{1}{3}$	(4)
1.7	$(2p^2q^3) \times \frac{5p^0q}{q^5} = (2p^2q^3) \times \frac{5q}{q^5} = \frac{10p^2q^3}{q^5} = 10p^2q^{-2} = \frac{10p^2}{q^2}$	(3)
1.8	$(x^{-3})(x^2) = x^{-3+2} = x^{-1} = \frac{1}{x}$	(1)
1.9	$(a^2.a^{-5}.a^3) \div a^4 = a^0 \div a^4 = \frac{1}{a^4}$	(2)
1.10	$\frac{(3x^3y^2)^3(x^2y)^0}{(xy^3)^2} = \frac{27x^9y^6 \times 1}{x^2y^6} = 27x^{9-2}y^{6-6} = 27x^7$	(3)

PATTERNS, FUNCTIONS AND ALGEBRA

<table>
<tr><td>1</td><td></td><td></td></tr>
<tr><td>1.1</td><td>90 and 69</td><td>(2)</td></tr>
<tr><td>1.2</td><td>36; 72; 108; 144; 180 ; 216</td><td>(2)</td></tr>
<tr><td>1.3</td><td>39; 48</td><td>(2)</td></tr>
<tr><td>2</td><td></td><td></td></tr>
<tr><td>2.1</td><td>Add 6.</td><td>(1)</td></tr>
<tr><td>2.2</td><td>$T_n = 6n - 3$</td><td>(1)</td></tr>
<tr><td>2.3</td><td>$6n - 3 = 45$
$6n = 48$
$n = 8$
The 8th term = 45</td><td>(1)</td></tr>
<tr><td>3.1</td><td><table><tr><td>Number of panels</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td></tr><tr><td>Number of poles</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td></tr><tr><td>Number of slabs</td><td>6</td><td>12</td><td>18</td><td>24</td><td>30</td><td>36</td><td>42</td></tr></table></td><td>(2)</td></tr>
<tr><td></td><td></td><td></td></tr>
<tr><td>3.2</td><td>$T_n = n + 1$</td><td>(2)</td></tr>
<tr><td>3.3</td><td>$T_n = 6n$</td><td>(2)</td></tr>
<tr><td>3.4</td><td>$T_{10}(poles) = 10 + 1 = 11$
$T_{10}(slabs) = 6(10) = 60$</td><td>(2)</td></tr>
<tr><td>4</td><td><table><tr><td>Input</td><td>Rule</td><td>Output</td></tr><tr><td>1</td><td>$-2n + 3$</td><td>1</td></tr><tr><td>2</td><td></td><td>-1</td></tr><tr><td>3</td><td></td><td>-3</td></tr></table></td><td>(3)</td></tr>
<tr><td>5</td><td><table><tr><td>Input</td><td>Rule</td><td>Output</td></tr><tr><td>-2</td><td>$2x^2 - 1$</td><td>7</td></tr></table></td><td></td></tr>
</table>

		−1		1
		0		−1
		1		1
		2		7
				(5)
6				
6.1	$y = -2(0)^2 + 6(0) - 8 = -8$			(1)
6.2	$y = -2(-1)^2 + 6(-1) - 8 = -2 - 6 - 8 = -16$			(1)
6.3	$y = -2a^2 + 6a - 8$			
6.4	$y = -2(a + 2)^2 + 6(a + 2) - 8$ $= -2(a^2 + 4a + 4) + 6a + 12 - 8$ $= -2a^2 - 8a - 8 + 6a + 4$ $= -2a^2 - 2a - 4$			(4)
7				
7.1	$y = 3^0 = 1$			(1)
7.2	$y = 3^3 = 27$			(1)
7.3	$y = 3^{-2} = \frac{1}{9}$			(1)

PRODUCTS

1		
1.1	$6x - 3 - 5 = 6x - 8$	(2)
1.2	$5x - 6x + 3 = -x + 3$	(3)
1.3	$5x - 6x^2 + 3x = -6x^2 + 8x$	(3)
1.4	$a^2 - 9$	(2)
1.5	$9a^2 - 4$	(2)
1.6	$3(p^2 + 2p - 3) = 3p^2 + 6p - 9$	(3)
1.7	$-5(2p^4 + p^2q - q^2) = -10p^4 - 5p^2q + 5q^2$	(3)
1.8	$x^2 - 8x + 16$	(3)
1.9	$4x^2 - 12x + 9$	(3)

1.10	$3(16x^2 - 24x + 9) = 48x^2 - 72x + 27$	(3)
1.11	$a^2 - 5a + 6 - (a^2 + 4a + 4) = -9a + 2$	(5)
1.12	$3a^2 - 6a - 12a^2 + 12a - 5a^2 + 10 = -14a^2 + 6a + 10$	(6)
1.13	$(9x^2 - 1) - \frac{2}{3}(x^2 - 1) = 3x^2 - \frac{1}{3} - \frac{2}{3}x^2 + \frac{2}{3}$ $= \frac{7}{3}x^2 + \frac{1}{3}$	(6)
1.14	$4(x^2 - \frac{1}{16}) - (x^2 + \frac{1}{2}x + \frac{1}{16}) = 4x^2 - \frac{1}{4} - x^2 - \frac{1}{2}x - \frac{1}{16}$ $= 3x^2 - \frac{1}{2}x - \frac{5}{16}$	(6)
1.15.	$a\left(x^2y^2 - \frac{1}{a^2}\right) - a(x^2y^2 - \frac{2xy}{a} + \frac{1}{a^2})$ $= ax^2y^2 - \frac{1}{a} - ax^2y^2 + 2xy - \frac{1}{a}$ $= 2xy - \frac{2}{a}$	(6)

FACTORS

1.		
1.1	$4(2a + 3b)$	(2)
1.2	$-5(2p + 3q)$	(2)
1.3	$p^2 + q$	(1)
1.4	$4(6a - 3b + 4)$	(2)
1.5	$p^3(p - 1)$	(2)
1.6	$-2x(1 + x^2)$	(2)
1.7	$2t^2(4t^2 - 5)$	(2)
1.8	$6x^2(x^4 - 2x^2 + 3)$	(2)
1.9	$4t^4(2t^8 - 3t^4 - 5) = 4t^4(2t^4 - 5)(t^4 + 1)$	(2)
1.10	$m(p - q) - n(p - q) = (p - q)(m - n)$	(3)
1.11	$(x - y)(t^2 - z^2) = (x - y)(t - z)(t + z)$	(3)
1.12	$x - y)(x + y)$	(2)
1.13	$a(a^2 - b^2) = a(a - b)(a + b)$	(3)

1.14	$(p^2 + t^2)(p^2 - t^2) = (p^2 + t^2)(p + t)(p - t)$	(3)
1.15	$(4q^8 + p^3)(4q^8 - p^3)$	(2)
1.16	$3(x^2 - 9y^2) = 3(x - 3y)(x + 3y)$	(3)
1.17	$\frac{1}{2}(x^2 - 4) = \frac{1}{2}(x - 2)(x + 2)$	(3)
1.18	$\frac{1}{8}(4q^2 - p^2) = \frac{1}{8}(2q - p)(2q + p)$ **OR** $\frac{4q^2 - p^2}{8} = \frac{(2q - p)(2q + p)}{8}$	(3)
2		
2.1	$(97 - 3)(97 + 3) = (94)(100) = 9400$	(2)
2.2	$(101 - 100)(101 + 100) = 1(201) = 201$	(2)
2.3	$(55 - 25)(55 + 25) = (30)(80) = 2400$	(2)
2.4	$(20{,}5 - 15{,}5)(20{,}5 + 15{,}5) = (5)(36) = 180$	(2)

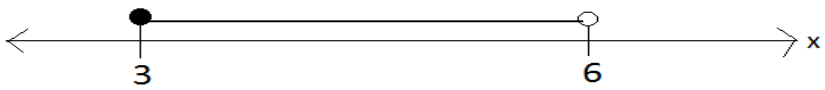
EQUATIONS

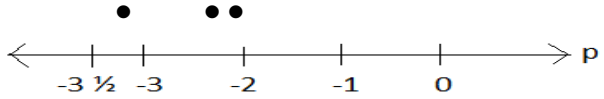
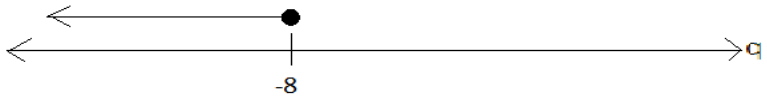
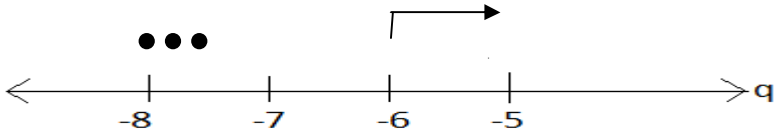
1.		(2)
1.1	$6a = 24$ $a = 4$	(3)
1.2	$a(a - 3) = 0$ $a = 0$ or $a = 3$	(2)
1.3	$2x + 4 = 9x - 12$ $7x = 16$ or $16 = 7x$ $x = \frac{16}{7}\frac{16}{7} = x$	(3)
1.4	$\times 36$: $9(x - 5) - 4(3 - 4x) = 468$ $9x - 45 - 12 + 16x = 468$ $25x = 525$ $x = 21$	(4)

<table>
<tr><td>1.5</td><td>$\times 15$: $45x + 3x + 195 = 5(2x + 1)$
$48x + 195 = 10x + 5$
$38x = -190$
$x = -5$</td><td>(4)</td></tr>
<tr><td>1.6</td><td>$5^x = 5^4$
$\therefore x = 4$</td><td>(2)</td></tr>
<tr><td>1.7</td><td>$2^{-x} = 2^5$
$\therefore -x = 5$
$x = -5$</td><td>(2)</td></tr>
<tr><td>1.8</td><td>$3^{x+1} = 3^4$
$\therefore x + 1 = 4$
$x = 3$</td><td>(2)</td></tr>
<tr><td>2.1</td><td>$n + n + 1 + n + 2 = 78$
$3n + 3 = 78$
$3n = 75$
$n = 25$
The numbers are 25; 26; 27</td><td>(4)</td></tr>
<tr><td>2.2</td><td><table><tr><th></th><th>AGE NOW</th><th>AGE IN 4 YEARS</th></tr><tr><td>Ben</td><td>x</td><td>$x + 4$</td></tr><tr><td>Patrick</td><td>$5x$</td><td>$5x + 4$</td></tr></table>
$5x + 4 = 3(x + 4)$
$5x + 4 = 3x + 12$
$2x = 8$
$x = 4$
Ben’s age is 4 years and Patrick’s is 20 years</td><td>(4)</td></tr>
<tr><td>2.3</td><td>Area = $l \times b$
$-12a^6 + 6a^3 = -6a^3 \times b$
$b = \frac{-12a^6 + 6a^3}{-6a^3}$
$b = \frac{-6a^3(2a^3 - 1)}{-6a^3} m$</td><td></td></tr>
</table>

	$b = (2a^3 - 1)m$	(3)
2.4	Area = $l \times b$ $2x^2 - 8 = l \times (x + 2)$ $l = \frac{2x^2 - 8}{x + 2}$ $l = \frac{2(x^2 - 4)}{x + 2}$ $l = \frac{2(x + 2)(x - 2)}{x + 2}$ $l = 2(x - 2)m$	(5)
2.5	$l = 2b$ Area = $l \times b = 32$ $2b \times b = 32$ $2b^2 = 32$ $b^2 = 16$ $b = \pm 4$ $b = 4$ (because $b > 0$) $\therefore b = 4m$ and $l = 2(4) = 8m$	(4)

INEQUALITIES

1.		
1.1		(2)
1.2		(2)

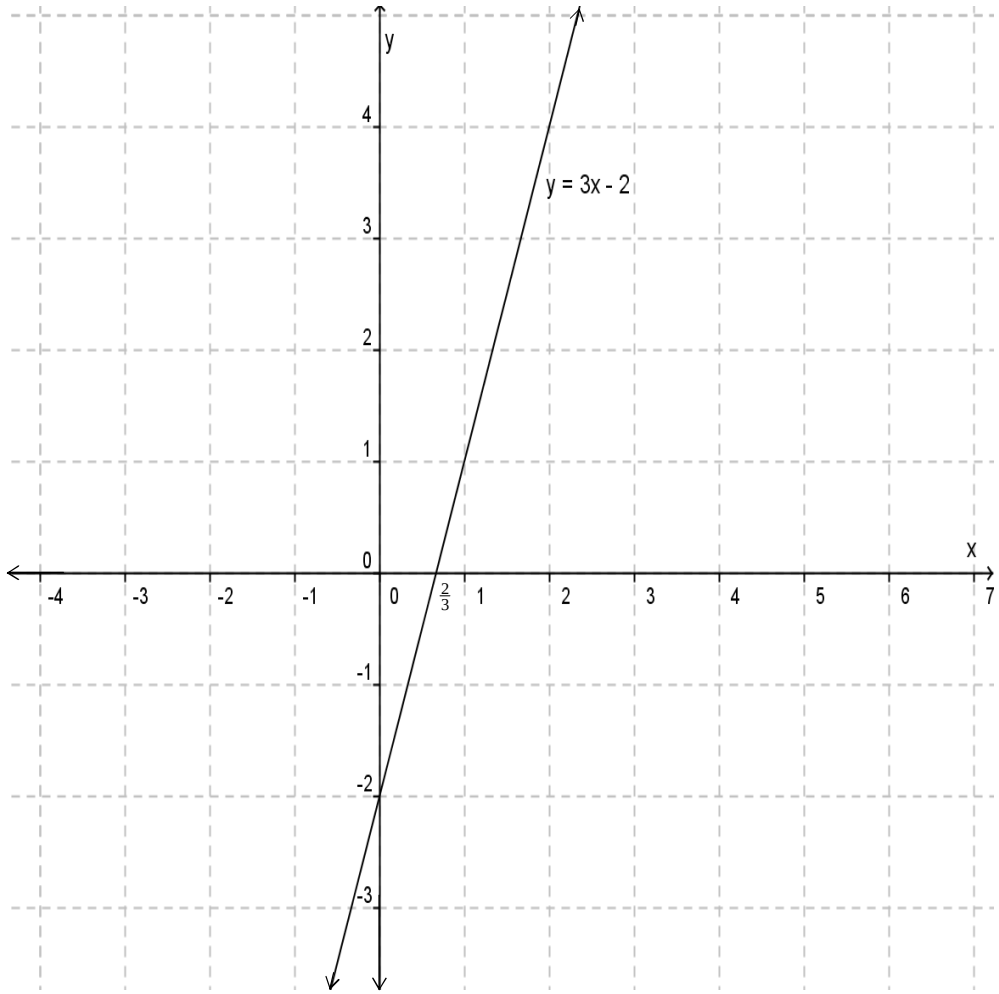
1.3		(2)
1.4		(2)
1.5		(2)
2		
2.1	$x < 2 \quad and \quad x \in R$	(2)
2.2	$3 \leq x \leq 7$and $x \in R$	(2)
2.3	$\sqrt{3} \leq x < 2,1$and $x \in R$	(2)
2.4	$-3 \leq x \leq 0$ and $x \in Z$ or $-4 < x < 1$ and $x \in Z$	(2)
2.5	$x < -2$ or $x \geq 0$ and $x \in R$	(2)

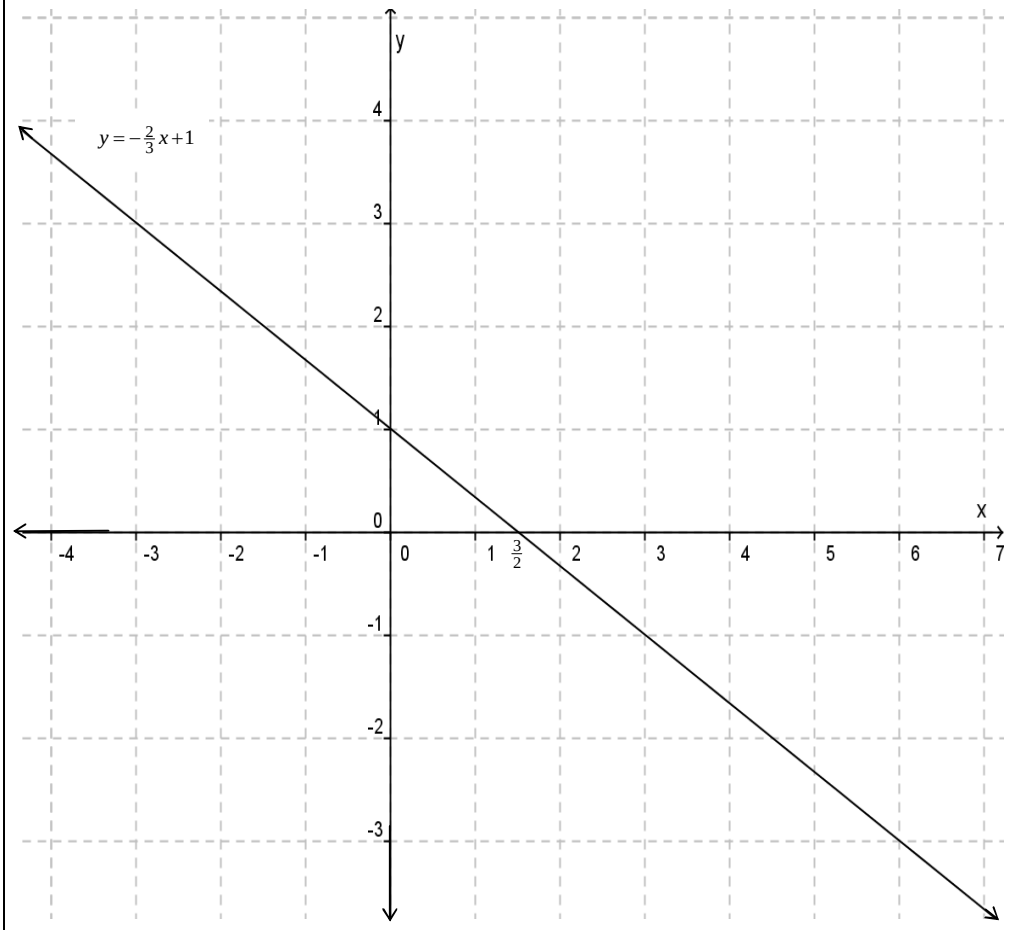
ALGEBRAIC FRACTIONS

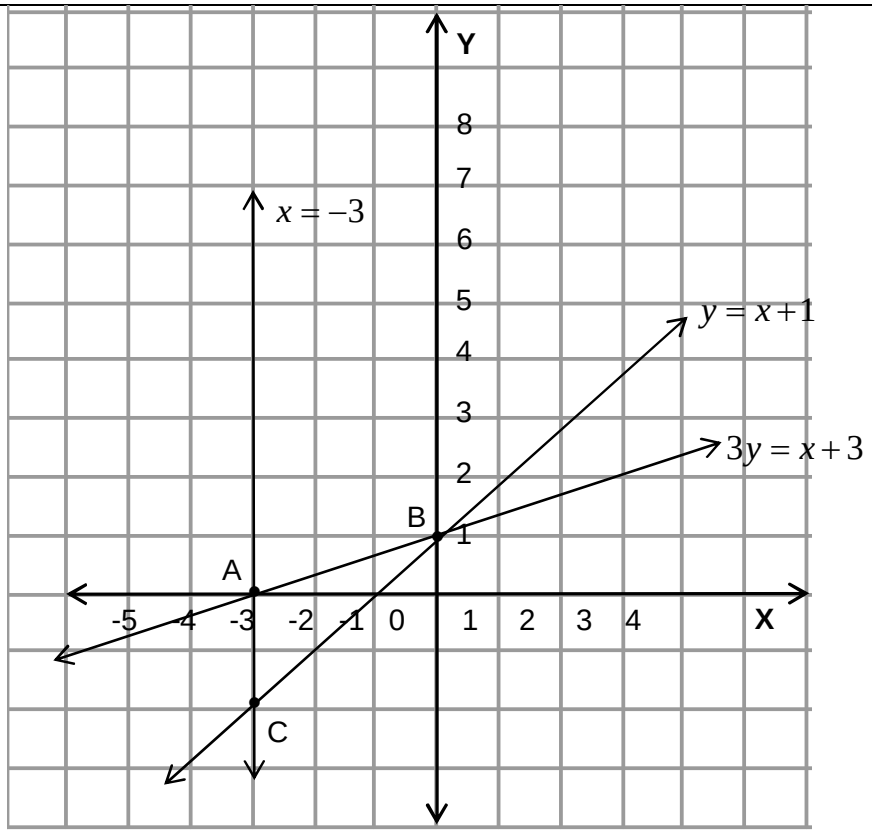
1.		
1.1	$2xy$	(2)
1.2	$x - y$	(2)
1.3	$\frac{3p^2q^4}{xy^2} \times \frac{2x^2y}{p^4q^2} \times \frac{y^2}{q^2} = \frac{6xy}{p^2}$	(5)

1.4	$\frac{x(x-4)}{4y} \times \frac{4xy}{xy(x-y)} \times \frac{y(y-1)}{x} = \frac{(x-4)(y-1)}{(x-y)}$	(5)
1.5	$\frac{x}{2} + \frac{x}{2} = \frac{2x}{2} = x$	(1)
1.6	$\frac{3(7x-5)-2(10x-7)}{6} = \frac{21x-15-20x+14}{6} = \frac{x-1}{6}$	(3)
1.7	$\frac{5(6x-10)+6(3x-5)-180}{30} = \frac{30x+50+18x-30-180}{30}$ $= \frac{48x-60}{30}$ $= \frac{16(3x-10)}{30}$ $= \frac{8(3x-10)}{15}$	(4)
1.8	$\frac{3(x-1)-(x+2)(x+1)}{(x-1)(x+1)} = \frac{3x-3-x^2-3x-2}{(x-1)(x+1)}$ $= \frac{-x^2-5}{(x-1)(x+1)}$	(4)

GRAPHS

1			
1.1	 y x y = 3x - 2 4 3 2 1 0 -1 -2 -3 -4 -3 -2 -1 0 $\frac{2}{3}$ 1 2 3 4 5 6 7		(4)

1.2			(4)
2.			
2.1	$y = -2x - 2$		(2)
2.2	$y = -2x + 3$		(2)
2.3	$y = \frac{1}{3}x + 1$		(2)

3.	 Y 8 7 6 5 4 3 2 1 $x = -3$ $y = x + 1$ $3y = x + 3$ B A -5 -4 -3 -2 -1 0 1 2 3 4 X C	(3)
4.	$y = 2x + 2$	(3)

SPACE AND SHAPE

1.			
1.1	A.Trapezium B. Octagon C. Triangle D. Rectangle E. Parallelogram	(5)	
1.2	A. cylinder B. rectangular-based pyramid C. cube D. triangular pyramid	(4)	
2.1	$E\widehat{D}B$	(1)	
2.2	70° East of North or 20° North of East or 70° North	(2)	
3.	In ΔPQS and ΔRSQ $P\hat{Q}S = Q\hat{S}R$ = 90°(given) QS is common $PS = QR$ (given) $\therefore \Delta PQS \equiv \Delta RSQ$ (90°, hyp, s)	(5)	
4.	$AB^2 + BC^2 = AC^2$(Pyth) $AB^2 + (3)^2 = (5)^2$ $AB^2 = 25 - 9unit^2$ $AB^2 = 16unit^2$ AB = 4unit $AD = AB - DB$ = $4 - \sqrt{7}$ unit $DC^2 = BD^2 + BC^2$(Pyth) = 7 + 9 unit^2 = 16unit^2 DC = 4 units	(5)	

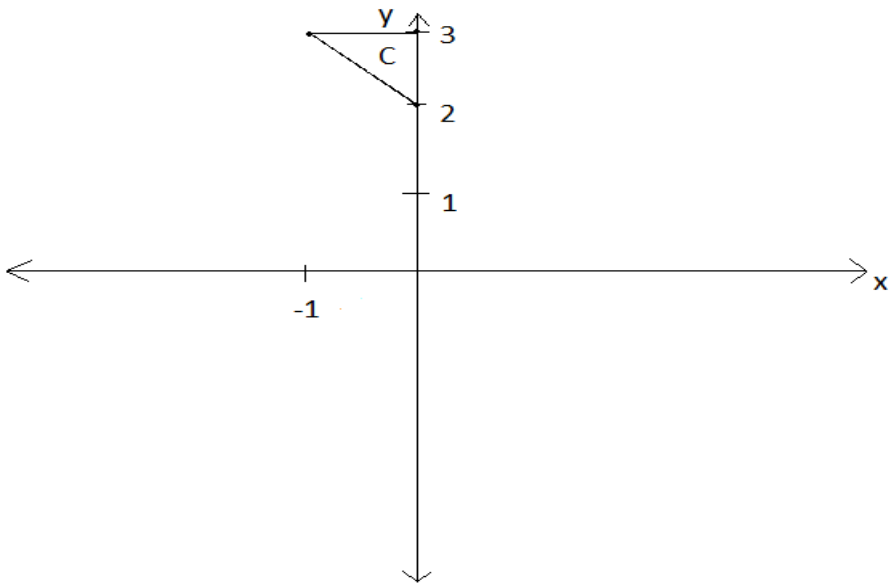
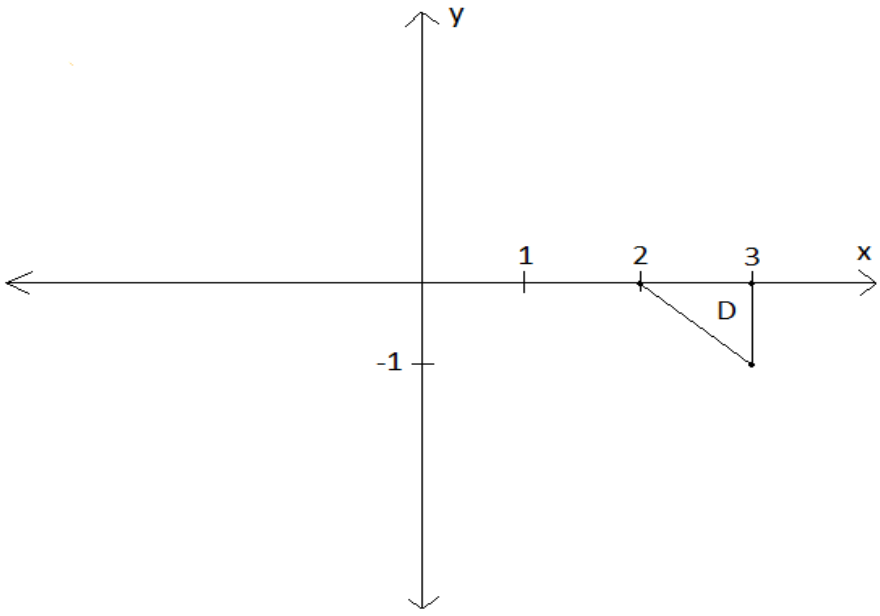
5.	2 $\hat{L}$ + $\hat{M}$ = 180° (co-int< s;$Kl||NM$) $\hat{L}$ + 120° = 180° 2$\hat{L}$ = 60° 2$\hat{L}$ + $\widehat{T_1}$ + $\widehat{K_2}$ = 180° (sum of < s of Δ) but $\widehat{T_1}$ = $\widehat{K_2}$(< s opp equal sides) 2$\hat{L}$ + 2$\widehat{T_1}$ = 180° 60° + 2$\widehat{T_1}$ = 180° 2$\widehat{T_1}$ = 120° ∴ $\widehat{T_1}$ = 60° $\widehat{2M}$ + $\widehat{T_3}$ + $\widehat{N_3}$ = 180°(sum of < s of Δ) but $\widehat{T_3}$ = $\widehat{N_3}$ (< $s$oppequal sides) 2 $\hat{M}$ + 2$\widehat{T_3}$ = 180° 120° + 2$\widehat{T_3}$ = 180° 2$\widehat{T_3}$ = 60° ∴ $\widehat{T_3}$ = 30° 2$\widehat{T_1}$ + $\widehat{T_2}$ + $\widehat{T_3}$ = 180° (suppl< s on a str line or $L\hat{T}M$ is a str. <)60° + $\widehat{T_2}$ + 30° = 180° 2$\widehat{T_2}$ = 180° – 90° = 90°	(4)
6.	$L\hat{N}P = L\hat{P}N$ (< s opp. $equal$ sides) 40° + $L\hat{N}P$ + $L\hat{P}N$ = 180° (sum of < s of Δ) 2$L\hat{P}N$ = 180° – 40° 2$L\hat{P}N$ = 140° $L\hat{P}N$ = 70° $P\hat{L}M = L\hat{P}N$ = 70° (alt < $s, KM||NP$) $T\hat{L}M + P\hat{L}M$ = 180° (suppl< s on a str line or K$\hat{L}M$ is a str. <) $T\hat{L}M$ = 180° – 70° 2$T\hat{L}M$ = 110°	(6)

7.		
7.1	In ΔPSQ and ΔRQS $SQ = SQ$ (common side) $\widehat{Q_1} = \widehat{S_1}$ (alt. $< s, PQ \| \| SR$) $\widehat{P_2} = \widehat{R_2}$(alt. $< s, PS \| \| QR$) $\therefore \Delta PS \equiv \Delta RQS$ $(<, <, s)$ $\therefore PQ = SR \; and$ $PS = QR$ $(corr. sides \; of \; congruent \; \Delta)$	(4)
7.2	In ΔPMQ and ΔRMS $PQ = SR$ (proved above) $\widehat{Q_1} = \widehat{S_1}$(alt. $< s, PQ \| \| SR$) $\widehat{P_2} = \widehat{R_2}$ (alt. $< s, PS \| \|$) $\therefore \Delta PMQ \equiv \Delta RMS($ $<, <, S)$ $\therefore PM = MR \; and \; SM = QM$ $(corr. sides \; of \; congruent \; \Delta)$	(4)
7.3	The diagonals of a parallelogram bisect each other.	(1)
8.	$\frac{PQ}{UV} = \frac{QR}{VW} = \frac{RS}{WX} = \frac{PS}{UX}$(prop. sides of similar quads) $\frac{PQ}{9} = \frac{7}{28}$ $PQ = \frac{9 \times 7}{28} = 2{,}25$ $\frac{6}{VW} = \frac{7}{28}$ $VW = \frac{6 \times 28}{7} = 24$	(6)

9.	In ΔKLO and ΔMNO $\hat{L} = \hat{M}$(alt < $s, KL\|\|MN$) $\hat{K} = \hat{N}$(alt < $s, KL\|\|MN$) $\widehat{O_1} = \widehat{O_2}$(vert. opp< s) ΔKLO ||| ΔMNO (<, <, <) $\therefore \frac{KL}{MN} = \frac{KO}{ON} = \frac{OL}{OM}$(prop. sides of similar Δs) $\therefore \frac{2}{6} = \frac{3}{ON}$ $ON = 9$ and $\frac{2}{6} = \frac{2,5}{OM}$ $OM = 7,5$ $LM = OL + OM$ $LM = 2,5 + 7,5 = 10\ cm$	(6)

TRANSFORMATIONS

1.			
1.1	$(-1;-4)$		(1)
1.2	$(3;-6)$		(1)
1.3	$(-3;-4)$		(1)
1.4	$(-4;3)$		(1)
2.	Reflection about the X-axis		(4)
3.	Vertical translation		
3.1	Reflection about the Y-axis		(2)
3.2	Reflection about the Y-axis and then reflection about the X-axis or reflection about the X-axis and then reflection about the Y-axis		(4)
4.	$A'(-6;9)$; $B'(3;15)$; $C'(15;-6)$		(3)

5.1	 (1)
5.2	 (1)

MEASUREMENT

1.			
1.1	Area of $\Delta CED = \frac{1}{2}bh = \frac{1}{2} \times 3 \times 4\,\text{cm}^2 = 6\text{cm}^2$		(2)
1.2	Area of $\Delta GBE = \frac{1}{2}bh = \frac{1}{2} \times 6 \times 4\,\text{cm}^2 = 12\text{cm}^2$		(3)
1.3	Area of ADEG$= \frac{1}{2}(AD + GE)BF = \frac{1}{2}(9 + 6)4\,\text{cm}^2 = 30\text{cm}^2$		(3)
1.4	Area of BDEG$= b \times h = 6 \times 4\,\text{cm}^2 = 24\text{cm}^2$		(3)
1.5	$BE^2 = BC^2 + EC^2$ (Pyth) $= 3^2 + 4^2\text{cm}^2$ $= 9 + 16\text{cm}^2$ $= 25\text{cm}^2$ $\therefore$ BE = 5cm		
1.6.1	Perimeter of $\Delta GBE = (5 + 5 + 6)\text{cm} = 16\text{cm}$		(2)
1.6.2	Perimeter of ADEG $= (9 + 5 + 6 + 4)\text{cm} = 24\text{cm}$		(4)
2.	$BC^2 = AB^2 + AC^2$ (Pyth) $= 49 + 120\,\text{unit}^2$ $= 169\,\text{unit}^2$ $BC = 13\,\text{units}$ Area $= \frac{1}{2}\pi r^2$ $= (\frac{1}{2} \times \pi \times \left(\frac{13}{2}\right)^2)\text{unit}^2$ $= 66{,}36\,\text{unit}^2$		(3)
3.			
3.1	Total surface area$= 2(8 \times 12) + 2(12 \times 18) + 2(8 \times 18)\text{cm}^2$ $= 912\text{cm}^2$		(6)
3.2	Volume$= l \times b \times h$ $= (8 \times 12 \times 18)\text{cm}^3$ $= 1728\text{cm}^3$		(3)

4.	Volume of cylinder= $\pi r^2 h$ $550 = \frac{22}{7} \times (5)^2 \times h$ $h = \frac{550 \times 7}{22 \times (5)^2} cm$ $h = 7cm$		(4)
5.	Volume = $l \times b \times h$ $50 \times 30 \times h = 24000cm^3$ $h = (\frac{24000}{50 \times 30})cm$ $h = 16cm$		(3)

DATA HANDLING

1.		
1.1	20 30 30 40 50 50 60 70 70 70 70 80 80 90 100	(1)
1.2		
1.2.1	Median = 70	(1)
1.2.2	Mode = 70	(1)
1.2.3	Range = 100 – 20 = 80	(1)
1.2.4	Mean = $\frac{910}{15}$ = 60,67 to decimal places	(2)
2.		
2.1	24 passengers	(1)
2.2	Range = 70 – 1 = 69	(1)
2.3	Mean= $\frac{641}{24}$ = 26,7 = 27	(3)
2.4		(4)

AGES IN YEARS (INTERVAL)	TALLY MARKS	FREQUENCY
1 - 13	~~IIII~~I	7
14 - 26	III	3
27 - 39	~~IIII~~II	8
40 - 70	~~IIII~~	6

<table>
<tr><td>2.5</td><td>27-39</td><td>(1)</td></tr>
<tr><td>2.6</td><td>18 passengers</td><td>(1)</td></tr>
<tr><td>3.</td><td></td><td></td></tr>
<tr><td>3.1</td><td>22</td><td>(1)</td></tr>
<tr><td>3.2</td><td>range= 15 – 2 = 13</td><td>(1)</td></tr>
<tr><td>3.3</td><td>
<table>
<tr><th>SHOE SIZES (INTERVAL)</th><th>TALLY MARKS</th><th>FREQUENCY</th></tr>
<tr><td>1 - 5</td><td>IIII</td><td>4</td></tr>
<tr><td>6 - 10</td><td>~~IIIIIII~~I</td><td>12</td></tr>
<tr><td>11 - 15</td><td>~~IIII~~I</td><td>6</td></tr>
</table>
</td><td>(4)</td></tr>
<tr><td>4.</td><td></td><td></td></tr>
<tr><td>4.1</td><td>18 babies</td><td>(2)</td></tr>
<tr><td>4.2</td><td>15 babies</td><td>(1)</td></tr>
<tr><td>4.3</td><td>11 – 15 months</td><td>(1)</td></tr>
<tr><td>5.1</td><td>
<table>
<tr><th>DIE</th><th>COIN</th><th>COMBINED OUTCOMES</th></tr>
<tr><td>1</td><td>H
T</td><td>1H
1T</td></tr>
<tr><td>2</td><td>H
T</td><td>2H
2T</td></tr>
<tr><td>3</td><td>H
T</td><td>3H
3T</td></tr>
<tr><td>4</td><td>H
T</td><td>4H
4T</td></tr>
<tr><td>5</td><td>H
T</td><td>5H
5T</td></tr>
<tr><td>6</td><td>H
T</td><td>6H
6T</td></tr>
</table>
</td><td>(6)</td></tr>
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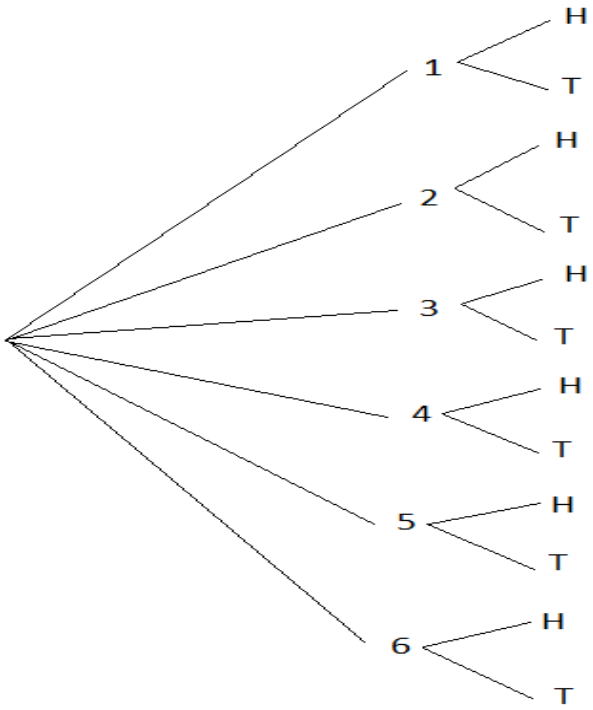
5.2		(2)
5.3 5.3.1	$\frac{1}{12}$	(1)
5.3.2	$\frac{3}{12} = \frac{1}{4}$	(1)
6.1	$\frac{1}{10}$	(1)
6.2	$\frac{1}{10}$	(1)
6.3	$\frac{2}{10} = \frac{1}{5}$	(1)
7.		
7.1	$\frac{18}{30} = \frac{3}{5}$	(1)
7.2	$\frac{12}{30} = \frac{2}{5}$	(1)
8.		
8.1	3	(1)

8.2.1	$\frac{3}{10}$	(1)
8.2.2	$\frac{2}{10} = \frac{1}{5}$	(1)
8.2.3	$\frac{1}{10}$	(1)