Marks: ____ / 56

Mathematics P1 Revision (2)

Name: ______________________ **Class:** ________ **Date:** ____________

1. A length of 5 cm on a map represents an actual distance of 2.5 km. A fruit plantation is represented by an area of 22.5 cm^2 on the map. Find
   (a) the scale of the map, in the form of 1 : *n*. [1]
   (b) the length of the plantation on the map if the actual length is 3.6 km. [1]
   (c) the actual area, in km^2 of the plantation. [2]

(a) 5cm : 2.5 km

1 cm : 0.5 km

1 : 50 000

(b) Length of plantation on map

$= \frac{3.6}{0.5}$

$= 7.2$ cm

c) Area Scale

$1^2 \text{ cm}^2 : 0.5^2 \text{ km}^2$

$1 \text{ cm}^2 : 0.25 \text{ km}^2$

Actual area $= 22.5 \times 0.25$

$= 5.625 \text{ km}^2$

2. Simplify each of the following, leaving your answers in positive indices:

(a) $\frac{10a^3c}{12b^2} \div \frac{30a^5c^3}{24ab^3}$ [2]

(b) $\frac{3a^0 \times (ab^2)^3}{\sqrt{a}}$ [2]

(a) $\frac{10a^3c}{12b^2} \div \frac{30a^5c^3}{24ab^3}$

$= \frac{10a^3c}{12b^2} \times \frac{24ab^3}{30a^5c^3}$

$= \frac{2}{3} \times \frac{a^4}{a^5} \times \frac{b^3}{b^2} \times \frac{c}{c^3}$

$= \frac{2b}{3ac^2}$

b) $\frac{3a^0 \times (ab^2)^3}{\sqrt{a}}$

$= \frac{3 \times (a^3b^6)}{a^{\frac{1}{2}}}$

$= 3a^{\frac{5}{2}}b^6$

3. Look at the following figures that are formed by squares of the same size

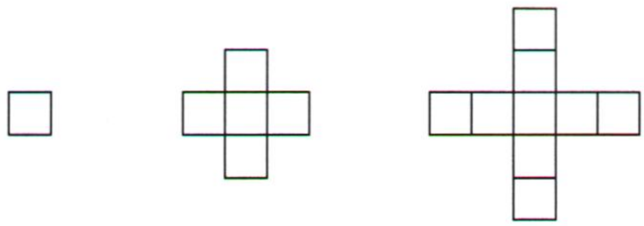


Figure 1 Figure 2 Figure 3

(a) Complete the table below:

Figure No.	No. of Squares
1	1
2	5
3	9
4	13

[2]

(b) How many squares are there in Figure 20? [1]

(c) Write down the number of squares, in terms of n, in Figure n. [1]

(b) No. of squares in Fig 20.

$= 1 + (20-1)(4)$

$= 77$ //

(c) No. of squares in Fig. n

$= 1 + (n-1)(4)$

$= 4n - 3$ //

4. (a) Simplify $\frac{(ab^4)^2}{3ab^3} \times \frac{16b}{(2ab)^3}$ [2]

(b) Express as a single fraction in its simplest form $\frac{3}{4r^2-1} - \frac{2}{1-2r}$ [3]

(a) $\frac{(ab^4)^2}{3ab^3} \times \frac{16b}{(2ab)^3}$

$= \frac{a^2b^8}{3ab^3} \times \frac{16b}{8a^3b^3}$

$= \frac{2}{3} \times \frac{a^2}{a^4} \times \frac{b^9}{b^6}$

$= \frac{2b^3}{3a^2}$

b) $\frac{3}{4r^2-1} - \frac{2}{1-2r} = \frac{3}{(2r-1)(2r+1)} - \frac{2}{1-2r}$

$= \frac{3}{(2r-1)(2r+1)} + \frac{2}{2r-1}$

$= \frac{3+2(2r+1)}{(2r-1)(2r+1)}$

$= \frac{3+4r+2}{(2r-1)(2r+1)} = \frac{4r+5}{(2r-1)(2r+1)}$

5. 4 men working 4 hours a day, can build a compound well in 4 days. In how many days will 8 men, working 8 hours a day at the same rate, complete the same job? [2]

4 men —— 2 days (8 hours per day)

1 man —— 8 days (8 hrs per day)

8 men —— $\frac{8}{8} = 1$ day (8 hrs per day)

8 men take 1 day to complete the same job.

6. An electron has a mass of 9.11×10^{-31} kg. This is $\frac{1}{1836}$ that of a proton.

(a) Find the mass of a proton. [1]

(b) How many electrons are there in a mass of 2.733×10^{-27} kg? [1]

Leave your answers in standard form.

(a) Mass $= 9.11 \times 10^{-31} \times 1836$

$= 1.672 \times 10^{-27}$

$= 1.67 \times 10^{-27}$ kg

(correct to 3 sig. fig.)

b) No. of electrons

$= (2.733 \times 10^{-27}) \div (9.11 \times 10^{-31})$

$= 3 \times 10^3$

7. The ratio of the base areas of 2 similar containers is 16 : 25. Both containers are filled with water. The volume of water in the smaller container is 16 litres. Find the volume of water in the larger container. [2]

$\frac{A_S}{A_L} = \frac{16}{25}$

$\frac{l_S}{l_L} = \sqrt{\frac{16}{25}} = \frac{4}{5}$

$\frac{V_S}{V_L} = \left(\frac{4}{5}\right)^3$

$\frac{16}{V_L} = \frac{64}{125}$

$V_L = 31.25\,l$

The volume of water in larger container is $31.25\,l$.

8. Given that $y = \dfrac{t+a}{t-b}$, make t the subject of the formula. [2]

$y(t-b) = t+a$

$yt - yb = t + a$

$yt - t = a + yb$

$t(y-1) = a + yb$

$t = \dfrac{a+yb}{y-1}$ //

9. Solve the equation $\dfrac{2x}{x+3} = \dfrac{7}{2x+1}$. [3]

$\dfrac{2x}{x+3} = \dfrac{7}{2x+1}$

$2x(2x+1) = 7(x+3)$

$4x^2 + 2x = 7x + 21$

$4x^2 - 5x - 21 = 0$

$(x-3)(4x+7) = 0$

$x = 3$ or $x = \dfrac{7}{4}$ //

$+x$	-3	$-12x$
$+4x$	$+7$	$+7x$
$4x^2$	-21	$-5x$

10. Solve the following equations:

(a) $4^{5x} \div 16 = \dfrac{1}{64}$ [2]

(b) $(2x-3)^3 = \dfrac{1}{27}$. [2]

(a) $4^{5x} \div 16 = \dfrac{1}{64}$

$4^{5x} \div 4^2 = \dfrac{1}{4^3}$

$4^{5x-2} = 4^{-3}$

$5x - 2 = -3$

$x = -\dfrac{1}{5}$ //

b) $(2x-3)^3 = \dfrac{1}{27}$

$2x - 3 = \sqrt[3]{\dfrac{1}{27}}$

$2x - 3 = \dfrac{1}{3}$

$2x = 3\frac{1}{3}$

$x = 1\frac{2}{3}$ //

11. Given that y is directly proportional to $(2x + 1)^2$. The value of y when $x = 1.5$ is 48.
(a) Express y in terms of x. [2]
(b) Hence find the value of y when $x = 7$. [1]

(a) $y = k(2x+1)^2$

When $x = 1.5$, $y = 48$

$48 = k(2(1.5)+1)^2$

$48 = 16k$

$k = 3$

$\therefore \; y = 3(2x+1)^2$ //

b) When $x = 7$,

$y = 3(2(7)+1)^2$

$y = 675$ //

12. Solve the inequality $7x + \frac{1}{5} > 3\frac{1}{5} + 5x$ and hence state the least integer value of x that satisfies the inequality. [3]

$7x + \frac{1}{5} > 3\frac{1}{5} + 5x$

$2x > 3$

$x > \frac{3}{2}$

Least integer value

$= 2$

13. Sketch the graph of $y = \left(1 - \frac{x}{2}\right)\left(1 + \frac{x}{2}\right)$ [3]

When $x = 0$,

$y = 1$

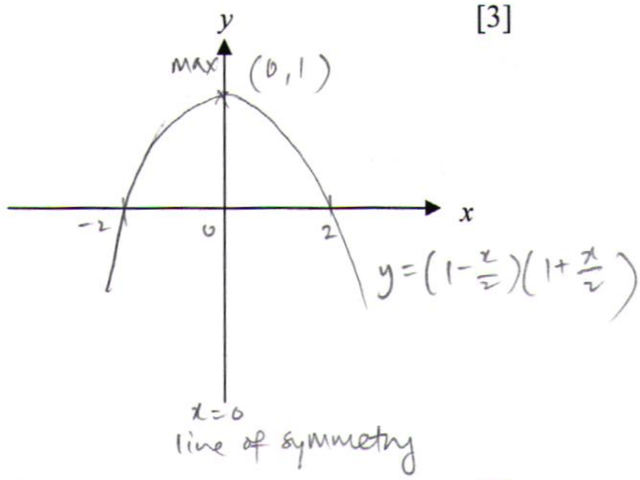
when $y = 0$,

$x = 2$ or $x = -2$

line of symmetry:

$x = \frac{2+(-2)}{2}$

$x = 0$



14. (a) Express $x^2 - 6x + 2$ in the form $(x-a)^2 + b$. [2]

(b) Hence sketch the graph of $y = x^2 - 6x + 2$. [3]

(a) $x^2 - 6x + 2$

$= x^2 - 6x + \left(\frac{-6}{2}\right)^2 - \left(\frac{-6}{2}\right)^2 + 2$

$= (x-3)^2 - 7$

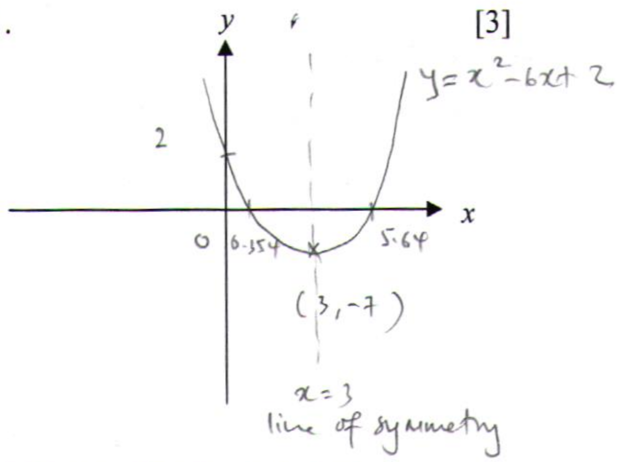
(b) When $x = 0$,

$y = 2$

when $y = 0$,

$x = 5.64$ or

$x = 0.354$



15. Given that x and y are integers such that $-3 < x < 0$ and $1 \le y < 4$, find

(a) the greatest value of $\frac{y^2}{x}$, [1]

(b) the least value of xy. [1]

(a) Greatest value of $\frac{y^2}{x}$

$= \frac{1^2}{-2}$

$= -\frac{1}{2}$

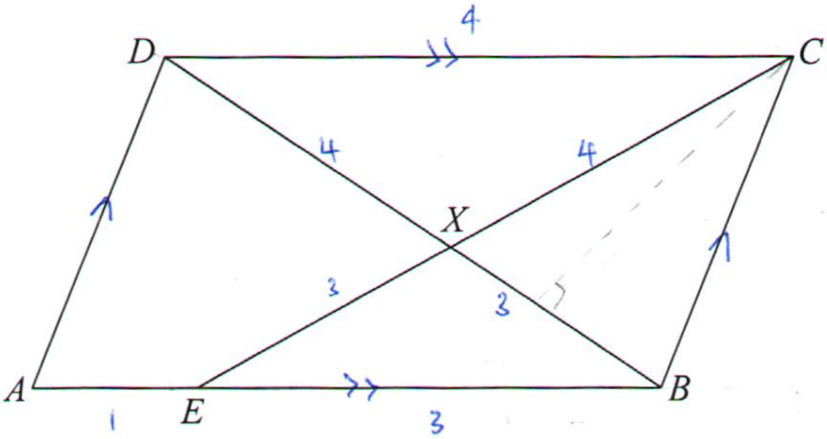
(b) Least value of xy

$= (-2)(3)$

$= -6$

16. *ABCD* is a parallelogram and *E* is a point on *AB*.

BD and *CE* meet at *X*.



$$\frac{\text{Area of } \Delta DXC}{\text{Area of } \Delta CXB} = \frac{\frac{1}{2}\times 4 \times h}{\frac{1}{2}\times 3\times h} = \frac{4}{3}$$

(a) Prove that triangles *BEX* and *DCX* are similar. [2]

(b) It is given that $4AE = AB$. Find the ratio

(i) area of ΔBEX : area of ΔDCX, [1]

(ii) area of ΔBCX : area of parallelogram *ABCD*. [1]

$4AE = AB$

$\frac{AE}{AB} = \frac{1}{4}$

(a) $\angle BXE = \angle DXC$ (vert. opp. $\angle s$)

$\angle BEX = \angle DCX$ (alt. $\angle s$, $CD // BE$)

$\angle EBX = \angle CDX$ (alt. $\angle s$, $CD // BE$)

$\therefore$ ΔBEX is similar to ΔDCX (AAA similarity)

(bii) Area of ΔBCX : Area of ABCD

3 : 14

(b)(i) Area of ΔBEX : Area of ΔDCX

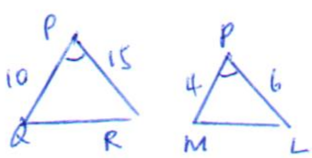
9 : 16

17. In the diagram, *PLQ* and *PMR* are straight lines. *PL* = 6 cm, *PM* = 4 cm, *MR* = 11 cm and *PQ* = 10 cm.

(a) Show that ΔPQR and ΔPML are similar. [3]

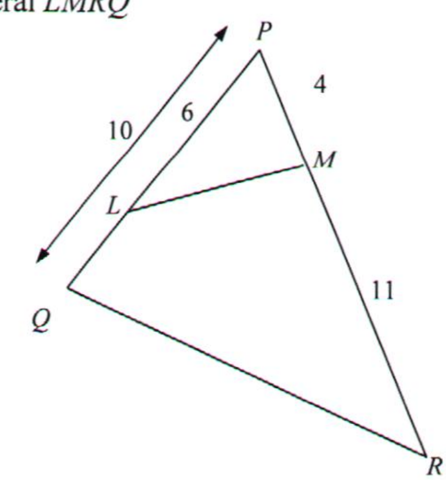
(b) Write down the numerical value of $\dfrac{\text{area of } \Delta PQR}{\text{area of quadrilateral } LMRQ}$. [1]

(A)



(b) $\frac{\text{Area of } \Delta PQR}{\text{Area of } LMRQ}$

$= \frac{25}{21}$



$\frac{PM}{PQ} = \frac{4}{10} = \frac{2}{5}$

$\frac{PL}{PR} = \frac{6}{15} = \frac{2}{5}$

$\angle QPR = \angle MPL$ (common angle)

$\therefore$ ΔPQR is similar to ΔPML (SAS similarity)

Area Ratio $= \frac{4}{25}$