Mathematics P1 Revision (1)

Marks: ____ / **54**

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

1. Simplify.

(a) $\dfrac{(-p^4)^6}{p^3 \times (-p^2)^9}$, [2]

(b) $\left(\dfrac{64}{x}\right)^{-\frac{2}{3}}$ [2]

(b) $\left(\dfrac{64}{x}\right)^{-\frac{2}{3}} = \left(\dfrac{x}{64}\right)^{\frac{2}{3}}$

$= \dfrac{x^{\frac{2}{3}}}{16}$ //

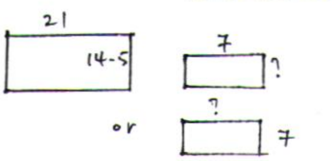
(a) $\dfrac{(-p^4)^6}{p^3 \times (-p^2)^9}$

$= \dfrac{p^{24}}{p^3 \times (-p^{18})}$

$= \dfrac{p^{24}}{-p^{21}} = -p^3$ //

2. Two rectangles are geometrically similar. The first has adjacent sides of length 14.5 cm and 21 cm. The second has one side of length 7 cm.

Find the two possible lengths of the adjacent side of the second rectangle. [2]



14.5 units —— 7 cm

1 unit —— $\frac{7}{14.5}$

21 units —— $\frac{7}{14.5} \times 21 = 10\frac{4}{29}$ cm

21 units —— 7cm

1 unit —— $\frac{7}{21}$

14.5 units —— $\frac{7}{21} \times 14.5 = 4\frac{5}{6}$ cm

∴ The two possible lengths are $4\frac{5}{6}$ cm and $10\frac{4}{29}$ cm.

3. Given that a is inversely proportional to $\sqrt{b}$, and $a = 4$ when $b = 9$,

(a) Find k. [1]

(b) Find the value of a when $b = 100$. [1]

(c) Find the value of b when $a = 3$. [1]

(a) $a = \dfrac{k}{\sqrt{b}}$

When $a = 4$, $b = 9$,

$4 = \dfrac{k}{\sqrt{9}}$

$k = 12$

∴ $a = \dfrac{12}{\sqrt{b}}$

b) When $b = 100$,

$a = \dfrac{12}{\sqrt{100}}$

$a = 1.2$ //

c) When $a = 3$,

$3 = \dfrac{12}{\sqrt{b}}$

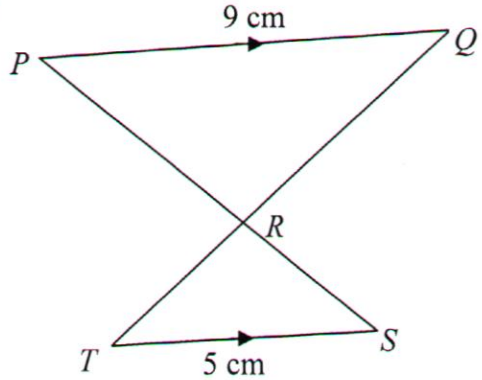
$\sqrt{b} = 4$

$b = 16$ //

4. In the diagram, $PQ = 9$ cm, $TS = 5$ cm, $\angle PQR = \angle RTS$, PRS and QRT are straight lines.

(a) Using the similar triangles PQR and STR, express as a fraction, the ratio $\frac{PR}{SR}$. [1]

(b) Hence find the ratio $\frac{Area\ of\ \Delta PSQ}{Area\ of\ \Delta RSQ}$. [1]



(a) $\frac{PR}{SR} = \frac{9}{5}$ //

(b) $\frac{\text{Area of } \Delta PSQ}{\text{Area of } \Delta RSQ} = \frac{\frac{1}{2} \times PS \times h}{\frac{1}{2} \times RS \times h}$

$= \frac{14}{5}$ //

5. Solve the equation $3x^2 - 5x - 7 = 0$, giving your answers correct to 2 decimal places. [3]

$a = 3,\ b = -5,\ c = -7$

$x = \frac{-(-5) \pm \sqrt{(-5)^2 - 4(3)(-7)}}{2(3)}$

$x = \frac{5 \pm \sqrt{109}}{6}$

$x = 2.573$ or -0.9067

$\therefore x = 2.57$ or $x = -0.91$ //
(correct to 2 dec.pl.)

6. (a) Expand and simplify $2a(2b - 3c)^2$. [2]

(b) Solve $3x - 4 \le 20 < 5x + 4$, showing your solution on a number line. [3]

(a) $2a(2b - 3c)^2$

$= 2a[4b^2 - 12bc + 9c^2]$

$= 8ab^2 - 24abc + 18ac^2$ //

(b) $3x - 4 \le 20 < 5x + 4$

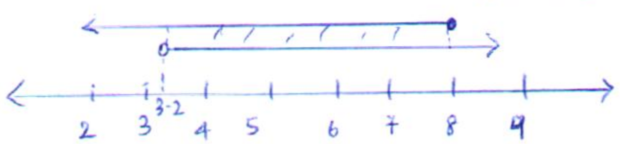
$3x - 4 \le 20$ and $20 < 5x + 4$

$5x + 4 > 20$

$3x \le 24$

$5x > 16$

$x \le 8$ and $x > 3.2$



$\therefore 3.2 < x \le 8$ //

7. Factorize completely each of the following:

(a) $3p^3 - 147p$ [2]

(b) $6xy - 2ab - ay + 12xb$ [2]

(a) $3p^3 - 147p = 3p(p^2 - 49)$
$= 3p(p-7)(p+7)$ //

(b) $6xy - 2ab - ay + 12xb = 6xy - ay - 2ab + 12xb$
$= y(6x - a) + 2b(6x - a)$
$= (6x - a)(y + 2b)$ //

8. On a map, 2 cm represents 3 km on actual ground.
The area of a park on the map is 4.5 cm^2.
(a) Express the scale of the map in the form 1 : *n*. [1]
(b) What length on the map represents an actual distance of 9.6 km? [1]
(c) Calculate the actual area of the park in km^2. [2]

Map scale

(a) 2 cm : 3 km
2 cm : 300 000 cm
1 : 150 000 //

(b) 3 km — 2 cm
1 km — $\frac{2}{3}$ cm
9.6 km — $\frac{2}{3} \times 9.6 = 6.4$ cm //
$\therefore$ 6.4 cm on the map represent 9.6 km.

Area Scale

c) 1^2 cm^2 : 1.5^2 km^2
1 cm^2 : 2.25 km^2

Actual area $= 4.5 \times 2.25$
$= 10.125$ km^2 //

9. (a) Simplify $\dfrac{b^{-2} \times b^5}{\sqrt[3]{b}}$ and give your answer in the form b^n. [2]

(b) Simplify $\left(\dfrac{169}{4x^6}\right)^{-\frac{1}{2}}$ leaving your answer in positive index form. [2]

(a) $\dfrac{b^{-2} \times b^5}{\sqrt[3]{b}}$

$= \dfrac{b^3}{b^{\frac{1}{3}}}$

$= b^{\frac{8}{3}}$ //

b) $\left(\dfrac{169}{4x^6}\right)^{-\frac{1}{2}} = \left(\dfrac{4x^6}{169}\right)^{\frac{1}{2}}$
$= \dfrac{2x^3}{13}$ //

10. The diagram below shows the first three of a sequence of square figures. Each figure consists of squares of different sizes.

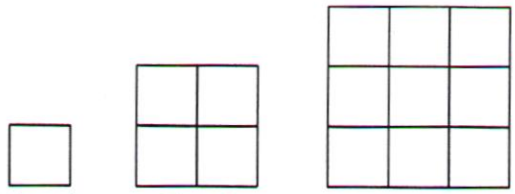


Figure 1 Figure 2 Figure 3

(a) Write down the total number of squares in Figure 3. [1]

(b) The information from the sequence of square figures is tabulated below.

Complete the table.

Figure	**Formula**	**Total number of squares**
1	1^2	1
2	$1^2 + 2^2$	5
3	$1^2 + 2^2 + 3^2$	14
4	$1^2 + 2^2 + 3^2 + 4^2$	30
5	$1^2 + 2^2 + 3^2 + 4^2 + 5^2$	55

[2]

(c) Figure M consists of 204 squares. Find the value of M. [2]

(a) Total no. of squares

= 14 //

c) $T_m = \frac{1}{6}(m)(m+1)(2m+1)$

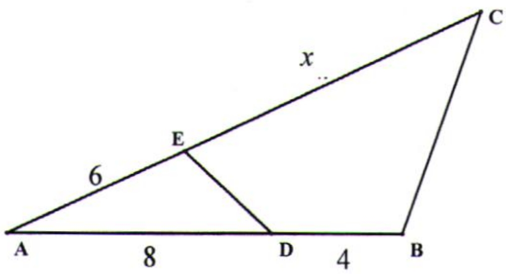
$= 204$

$\therefore m = 8$ //

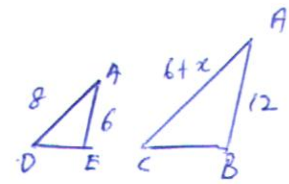
11. In the triangle ABC, D and E are points on AB and AC respectively such that ΔABC and ΔAED are similar, and AD = 8 cm, DB = 4 cm, AE = 6 cm and EC = x cm. Find

(a) the value of x, [2]

(b) area of ΔADE : area of quadrilateral BCDE. [2]



a)



$\frac{AE}{AB} = \frac{AD}{AC}$

$\frac{6}{12} = \frac{8}{6+x}$

$6(6+x) = 96$

$36 + 6x = 96$

$6x = 60$

$x = 10$

b) Area Ratio

$= \frac{\text{Area of } \Delta AED}{\text{Area of } \Delta ABC}$

$= \left(\frac{1}{2}\right)^2$

$= \frac{1}{4}$

Area of ΔADE : BCDE

1 : 3

12. The base areas of two similar cones are in the ratio 9 : 16.

(a) Find the ratio of their heights. [1]

(b) If the volume of the smaller cone is 200 cm^3, find the volume of the larger cone. [2]

(a) Area Ratio $= \frac{9}{16}$

Height Ratio $= \sqrt{\frac{9}{16}}$

$= \frac{3}{4}$

(b) $\frac{V_1}{V_2} = \left(\frac{3}{4}\right)^3$

$\frac{V_1}{V_2} = \frac{27}{64}$

$\frac{200}{V_2} = \frac{27}{64}$

$V_2 = \frac{64}{27} \times 200$

$= 474\frac{2}{27}$ cm^3

13. (a) Simplify $\frac{x^3}{14y^4} \div \frac{9x^2}{42(y^2)^2} \times \frac{3}{2xy}$ [2]

(b) If $x = a + (by)^2$, express y in terms of a, b and x. [2]

(a) $\frac{x^3}{14y^4} \div \frac{9x^2}{42(y^2)^2} \times \frac{3}{2xy}$

$= \frac{x^3}{14y^4} \times \frac{42y^4}{9x^2} \times \frac{3}{2xy}$

$= \frac{1}{2} \times \frac{x^3}{x^3} \times \frac{y^4}{y^5}$

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

(b) $x = a + (by)^2$

$x = a + b^2y^2$

$b^2y^2 = x - a$

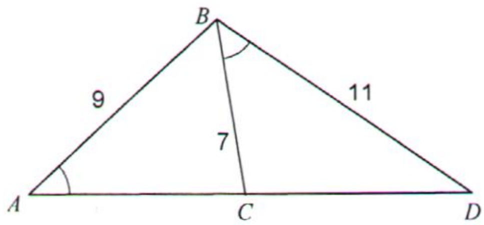
$y^2 = \frac{x-a}{b^2}$

$y = \sqrt{\frac{x-a}{b^2}}$

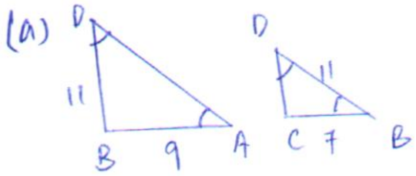
14. In the diagram, $\angle BAC = \angle DBC$

(a) Identify one pair of similar triangles and write your proof clearly. [2]

(b) Find the length of AD. [2]



(a)



$\angle BAC = \angle DBC$ (given)

$\angle ADB = \angle BDC$ (common)

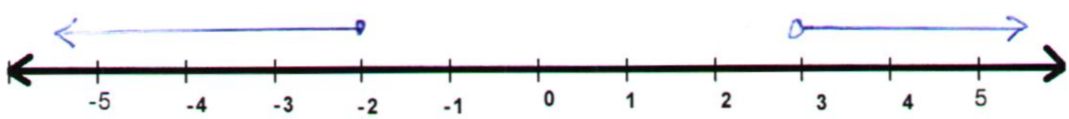
$\therefore$ ΔABD is similar to ΔBCD (AAA similarity)

(b) $\frac{BC}{AB} = \frac{BD}{AD}$ $\quad$ $\frac{7}{9} = \frac{11}{AD}$

$AD = 14\frac{1}{7}$ cm

15. Solve the inequalities and show your solution on the number line in the answer space. [3]

$$3y + 5 \le -1 \quad and \quad \frac{1}{3}y + 1 < \frac{y+1}{2}.$$



$3y+5 \le -1$ and $\frac{1}{3}y + 1 < \frac{y+1}{2}$

$3y \le -6$ $\quad$ $\frac{2}{3}y + 2 < y+1$

$y \le -2$ $\quad$ $\frac{2}{3} - y < 1-2$

$-\frac{1}{3}y < -1$

$y > 3$

$\therefore$ ~~$y \le -2$ or $y > 3$~~. There is no solution